RAILROAD GAZETTE

FRIDAY, DECEMBER 6, 1901.

CONTENTS

Michigan Central Speed Record—Correction.

In the report of a fast run on the Michigan Central, Sept. 5, which was published in the *Railroad Gazette*, Nov. 22, page 799, the starting point was not correctly given. The distance, time and rate of speed (62.45 miles an hour for 229 miles) were correctly shown, but the train began its trip, not at St. Thomas, but at the west side of the Niagara River, Bridgeburg.

Contributions

Overlooking Train Orders.

Ogden, Utah, Nov. 19, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

How best to guard against the error of overlooking train orders is a subject worth serious consideration. Being employed as a locomotive engineer I speak from practical experience, and my observations have led me to conclusions that I hope will throw some light on the subject.

It has been my experience that many firemen do not realize how important it is that they should know the contents of every order. The impression of many firemen, that they are not responsible for the fulfilment of train orders, should be corrected, and it is essential that every fireman should have as thorough knowledge of train orders, and the rules governing the movement of trains, as the engineer.

I have seen many engineers, after reading their orders, put them on a spindle or in their pocket, and utterly disregard the fireman. This is a habit which often leads to error; the results of which are frequently published in our daily papers. The practice is due to overconfidence on the part of the engineer in himself, and indifference on the part of the fireman.

As a precautionary measure I would suggest that the fireman receive a copy of each order as well as the engineer. It is true that his burdens are already great, but he is never so busy that he would not devote a few minutes to the reading of his orders if he had them convenient, and knew that he was held equally responsible with the engineer.

As long as the present system prevails and the rules of railroads are not rigidly enforced in regard to this matter, so long may we expect disasters due to the overlooking of orders. J. J. FLEMING.

The Relation of Brakes to Signals.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I have read with interest your editorial in the issue of Nov. 22 on "Some of the Uses of the High-Speed Brake." The highest speed for which figures of stops are mentioned in this article is 60 miles an hour, which can no longer be regarded as very high speed in passenger service. Many regular trains must make frequently upwards of 70 miles per hour on their ordinary schedules, while 80 and even 90 miles per hour are not uncommon. What distance is required to make stops at these speeds with the ordinary brake, and what is the gain by the use of the high-speed attachment? Taking your figures for stops at 60 miles an hour, and assuming the distance with each brake increases only as the square of the speed, at 90 miles an hour the distance required for stops with the quick-action brake only and with the high-speed attachment would be approximately 3,650 and 2,625 ft. respectively. Does this not come dangerously near the limit of safety even with the high-speed brake with the usual arrangement of home and distant signals? It is seldom the distant signal is placed farther than 2,700 to 3,000 ft. from the home signal, and it is frequently much nearer.

The inadequacy of this arrangement of signals, when the quick-action brake only is used at speeds of 90 miles an hour is alarmingly apparent. It would be interesting to know the relative value of the ordinary quick-action and high-speed brakes at speeds above 60 miles an hour as the proper arrangement of signals on some of our important lines seems to depend on the efficiency of the brakes at maximum speeds which are to-day surely much above 60 miles an hour. X. Y. Z.

[This letter leads us to reprint one received from Mr. George Westinghouse and printed by us nine years ago, viz., Sept. 23, 1892. Since that time the high-speed brake has been developed; but the facts and principles remain the same as when he stated them. Concerning these interesting and important matters we shall have something to say later.—EDITOR.]

Erskine Park, Lenox, Mass., Sept. 16, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE.

My attention has recently been called to an article [in another journal] relative to brakes and high-speed trains in which I was quoted as the authority. In consequence of the errors in the article referred to, and the importance of the questions raised, I desire, through your columns, to state some important facts bearing upon the subject, to which I am sure railroad officers will give careful consideration.

By referring to the celebrated Douglas Galton brake experiments it will be seen that, with the brakes in the best possible order, acting upon all of the wheels of one vehicle and up to their theoretical efficiency, it was only possible to reduce the speed at the rate of about three and a half miles per hour for each second the brakes were applied until the vehicle stopped; and it was further found during these experiments that the higher the speed, the less the brake shoes retarded the wheels with a given force applied to them; and that at 60 miles and upward, the brake force to be thoroughly efficient would have to be at least double that now usually employed in daily practice at speeds below 50 miles. With trains of considerable length it was shown that, with the brakes in the most perfect order possible, trains could be brought to a stand from a speed of 60 miles an hour, within about 1,200 ft., the brakes in these cases acting upon about 95 per cent. of the weight borne by the wheels of the train.

With a *perfect brake*, acting upon all of the wheels of an express train running at 90 miles an hour, it will be seen from Table No. 1 that at the end of 10 seconds the train would still be moving at a little over 60 miles an hour, and would have traveled a distance of about 1,130 ft. As a matter of fact, with the brake force now fitted to trains, the reduction of the speed of trains running above 60 miles an hour would, under favorable conditions, not exceed two miles for each second.

Table No. 2 will show the distance run during each second after the application of the brake, *under the best actual conditions*, and at the end of 16 seconds the train would be running 61 miles an hour, and would have traveled in that time 1,796 ft.

It requires no more than to call attention to the fact that the human vision is limited, to show the increased risk that is incurred running trains at 90 miles an hour, as compared with trains running at 60 miles an hour and under. A system of signals to provide for these high speeds would have to be absolutely perfect, and arranged at such distances apart that they would necessarily limit the capacity of the road for all trains that are run at a much lower speed, unless a double set of signals were provided, one for high speed and one for low speed.

The danger to a person crossing the tracks at a level with trains running at these high speeds would be multiplied many times, unless a system of gates were provided, with danger signals at nearly a mile from each crossing, which could only be lowered when the gates at the crossing had been properly closed; in fact, everything would have to be arranged so that nothing would be left entirely to the judgment of man. . . .

Table No. 1.

Speed	90 miles per hour
Feet per second	132
Time lost applying brakes	One second, with full application at end of second second.
Reduction first second	0 miles
" second "	1¾ "
" each second after	3½ "

With the above condition, the following figures are almost accurate (fractions omitted):

Seconds.	Feet traveled.	Speed at end of
1st	132	99
2d	131—	88¼
3d	126—	84¾
4th	121+	81¼
5th	116+	77¾
6th	111+	74¼
7th	106+	70¾
8th	101+	67¼
9th	96+	63¾
10th	90+	60¼
Total run	1,130 ft.	in ten seconds

To obtain the above results upon dry rails and upon the level would require a brake force of at least three times the total weight of the train, and this should be properly distributed upon every wheel in the train, and there would be needed a device on each car to automatically reduce the brake shoe pressure as the speed decreased.

Table No. 2.

Speed	90 miles per hour
Feet per second	132
Time lost applying brakes	One second, with full application at end of second second.
Reduction first second	0 miles
" second "	1 "
" each second after	2 "

The best to be expected from present well-fitted trains, with brakes in perfect order, in speeds above 60 miles per hour.

Seconds.	Feet traveled.	Speed at end of	Seconds.	Feet traveled.	Speed at end of
1st	132	90	9th	111	75
2d	131	89	10th	108	73
3d	129	87	11th	105	71
4th	126	85	12th	102	69
5th	123	83	13th	99	67
6th	120	81	14th	96	65
7th	117	79	15th	93	63
8th	114	77	16th	90	61
Total run	1,796 ft. in 16 sec.				

GEORGE WESTINGHOUSE, JR.

Economy in Locomotive Service.

BY G. R. HENDERSON.*

There probably never has been a time when economy in railroad operation was investigated and sought as at present. The great amount of competition and rivalry existing between lines of road occupying contiguous territory or operating between the same termini, has had the effect of forcing down charges for transportation; and in order to make a showing satisfactory to the owners, it has been necessary to go rigidly and scientifically into the various methods of economy best suited to the property, as by this means only can a satisfactory profit on the investment be produced. These economies, however, have certain arbitrary restrictions:

1. They must not interfere with the safety of operation, either to the public or employees, or the goods carried or the equipment.

2. They must not neglect to maintain all parts of the property in a condition suitable for the exigencies demanded by the service.

3. They must not cause a reduction in the speed or comfort of passenger trains, or delay the delivery of stock, merchandise, etc.

4. They must not permit the property to appear in a condition that will excite unpleasant contrasts by a critical public.

5. They must not engender dissatisfaction among the employees, as the best results can be obtained only by loyal and interested operatives.

6. They must not curtail the facilities for business offered by the company to its patrons.

In short, if economies violate any of these axioms, they will cease to be economies, particularly if continued long enough to diminish the value of the property. In this article, the economies to be made will refer chiefly to the locomotive service and the various functions pertaining to that branch.

The late A. M. Wellington, in his "Railway Location," shows that in general the percentage of operating expenses to gross revenue has increased since 1850, and the great reduction in rates during the last 50 years is ample reason for this apparent gain. For example, in 1852 the Pennsylvania Railroad received 4.64 cents per ton mile; in 1875, 1.126 cents, and in 1890, 0.54 cents. The expenses have also reduced enormously per ton mile, but could not keep pace with the reduction in receipts. The large increase in the volume of business transacted is responsible for the satisfactory conditions of railroad properties at the present time. Again, the Chicago & North Western freight earnings per ton-mile in 1874 were 2.06 cents, but in 1900 only .83 cents. The earnings in the transportation of the mails have decreased still more rapidly. When taken on the same basis, the passenger-mile rate has dropped from 2.89 cents to 1.98 cents in the same period.

That it is extremely difficult to reduce operating expenses proportionately with the revenue will appear at once from a consideration of the charges which go to make up these expenses. The following items will be only slightly, if at all, affected by moderate changes in conditions of traffic and, consequently, revenue.

Renewals of ties.
Repairs of roadway and track.
Repairs of bridges and culverts.
Repairs of buildings.
Repairs of docks.
Repairs of fences, etc.
Telegraph maintenance.
Telegraph operation.
Station supplies.
Agencies.
Clerks and laborers at stations.
Switchmen.
Flagmen.
Watchmen.
Loss and damage.
Advertising.
Traffic associations.
Rents of buildings, etc.

*Assistant Superintendent of Machinery, Santa Fe System.

Superintendence.
Legal expenses
Insurance.
General office expenses.
General officers and clerks.

For the year 1900, on the Chicago & North Western, these charges amounted to 45 per cent. of the operating expenses. For the same period these latter were 60 per cent. of the revenue. We find, then, that only 55 per cent. of the operating expenses, or 33 per cent. of the gross revenue, can be varied to suit moderate changes in the traffic. This means that with a loss of 10 per cent. in revenue, the controllable operating expenses must be reduced 30 per cent. in order to show the same profit to the owners, or that an increase in business of 10 per cent. will be as agreeable to the stockholders as a reduction of 30 per cent. in these expenses. These figures show at once with what untiring diligence and persevering energy it is necessary to prosecute economies at the first signs of a reduction in the volume of business, and how cheerfully all should lend their assistance in the attempt to stem the tide and prevent a shrinkage in the value of the property.

The locomotive operating expenses for the above-mentioned case, including fuel, lubrication, enginemen, roundhouse men, repairs and supplies and renewals, were 61½ per cent. of the controllable expenses, or 34 per cent. of the whole operating expenses, from which it appears that the motive power department must do a large share in the development of economy. In order to find out where economies can best be obtained, we must still further sub-divide these charges. The table below gives the percentage of the various items connected with locomotive operation to the total cost, and also to the total operating expenses:

Item.	Per cent. to total loco. expense.	Per cent. to total operating expense.
Fuel	36	12.3
Lubrication	1	.4
Enginemen	30	10.2
Hostlers and wipers	4	1.3
Roundhouse labor	3	1.0
Repairs, renewals and supplies	26	8.8
Total	100	34.0

We will now take these items up in detail and analyze each in an attempt to discover its present tendencies and how to control them.

Fuel.—This represents the greatest item of expense in locomotive operation, and it is but natural that it should receive the greatest amount of attention. It is, also, perhaps, the most difficult to control. Purchased in enormous quantities, and distributed with a lavish hand, the whole tendency is to cause a disregard for the actual value of coal, and when we consider that it is handled and used by various grades of men, from the foreigner who cannot speak our tongue to the intelligent but sometimes careless fireman, it can be readily understood what an undertaking is before us.

In speaking of coal economy we must not confound this with diminished coal consumption, as the two are entirely different. It is possible to practice the most rigid economy in the use of fuel by the motive power department, and yet have the percentage of cost of fuel to operating expenses increase. If the cost of fuel be determined on the engine-mile basis, any one of the following practices will cause an increase in the cost of fuel per mile, although many of them are considered good railroading.

1. Increase in the size of engine.
2. Increase in the weight of train.
3. Increase in the speed.
4. Increase in the time on the road, due to delays on side-tracks, etc.
5. Abnormally short runs, with consequent turning, standing, etc.
6. Abnormally long runs, allowing the fire to become dirty and wasteful of fuel.
7. Switching with a number of cars attached to engine.
8. Making up lost time.
9. Heating passenger trains in winter.
10. Lighting passenger trains from the engine.
11. Excessive use of air-brakes or leaky pipes, causing pump to work at a higher speed.
12. Careless operation and firing of the engine.
13. Poor condition of the machinery and boiler.
14. Hauling empty or lightly loaded cars.

If comparisons be made on the ton-mile basis, the above items will produce the same effect, with the exception possibly of 1 and 2. Even these will produce a wasteful effect if the engine is not properly loaded. In order to make clear the action of these wastes, they will be considered separately:

1. If the size of the engine is increased when there is not sufficient trainload to correspond, we have a waste of fuel in that the engine cannot be loaded so that an economical rate of cut-off may be maintained, and the steam will be used wastefully. Recent experiments show that if the cut-off be maintained less than 20 per cent. of the stroke, a waste in fuel will follow; yet the same load that will tax the engine to pull up a 45-ft. grade will require only 20 per cent. cut-off on a level.

The various data and experiments referred to in this article as having been made on the "standard" engine are the results of tests made with a locomotive of the following proportions:

Cylinders (simple), 20 x 26 in.
Driving wheel diameter, 63 in.
Steam pressure, 190 lbs.
Heating surface, 2,332 sq. ft.
Grate area, 29 sq. ft.
Weight on drivers, 118,000 lbs.
Weight of engine and tender, 130 tons.
Maximum available tractive force, 25,000 lbs.
Type of engine, 10-wheel.

On a dead pull up a 45-ft. grade, the maximum load for this engine will be 1,000 tons back of the tender. On a level this load can be drawn at 25 miles an hour at 20 per cent. cut-off. Therefore, if a short 45-ft. ruling grade existed with a long level stretch, there might be more coal consumed by the larger engine on the level than if a smaller engine had doubled or been given help over the hill. Each case will depend upon the individual conditions. As a rule, however, the amount of coal used per ton-mile will decrease as the weight of train increases.

2. An increase in weight of train always means an increased consumption of fuel per engine-mile, but *not necessarily* per ton-mile, as explained above. However, if the economical load be passed, there will be an increase even on the ton-mile basis. Just where this limit lies is rather difficult to state, but from a series of experiments recently conducted, it is certain that it occurs earlier and that the rate of coal consumption increases faster as the rate of grade is increased. For level track and speeds of 10 to 20 miles an hour, there is almost no increase in the coal rate, even with very heavy loads, but the presence of a grade brings an increase with even a moderate loading.

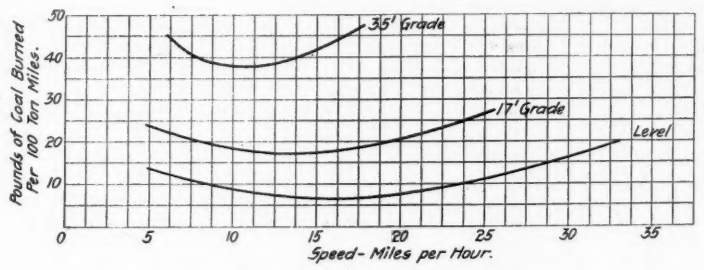


Diagram No. 1.—Fuel Consumption.
Trains of 1,000 tons back of tender on levels and 17 and 35 ft. grades.

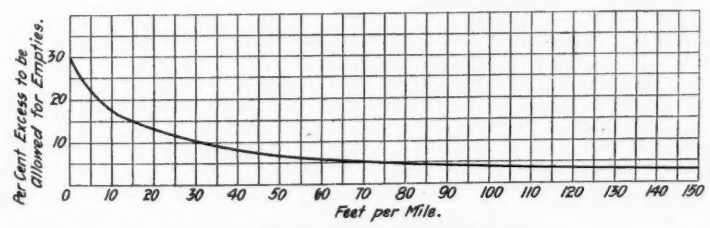


Diagram No. 2.—Empty Car Resistance.
Percentage of Excess to be Allowed.

Another rather curious result is sometimes found, and that is that a grade reduction may cause an increase in fuel per ton-mile. It is explained as follows, giving an actual case as example. A run 202 miles long had a 60-ft. ruling grade and a number of minor grades. The rating for this run was 1,050 tons, for 166 miles, and 750 tons for 36 miles, governed by the ruling 60-ft. grade. When this was reduced to a 37-ft. grade the tonnage was increased to 1,250 tons, and the consumption in pounds per ton-mile also went up. Upon investigating this mathematically the calculations showed that an increase of 3 lbs. per 100 ton-miles might be expected. Of course, the fixed charges of train crew wages, etc., were not affected per train-mile, and it was good business management, but the coal pile suffered in consequence.

3. Of all the causes for increasing the use of coal, the question of speed is probably the greatest factor: experiments on the standard engine showed that with various loads and on different grades the consumption was a minimum at about 15 miles an hour. Diagram No. 1 shows graphically what increases may be expected when we run a freight train above 15 miles an hour. This is why fast freight and stock runs are so much harder on coal, and also explains why the consumption per ton-mile in passenger service is about double that in freight. It is evidently unfair to make comparisons between runs whose speed is different, for the above reasons.

4. This covers troubles which, while the mechanical department is not generally responsible for them, militate against fuel economy. Even when standing, the engine must be "kept hot," and coal must be burned; but the most serious part of the trouble, especially in cold weather, lies in the fact that standing promotes leaky flues and fire-boxes, so that a double loss ensues. Train despatchers can do much to help out in this line, but when it is explained to them many express their surprise that the coal bill suffers in consequence of bad meeting orders and long waits on side-tracks. Insufficient sidings for meeting and passing points cannot be remedied by the best despatcher, and it is practically impossible to calculate what principle would be covered by the saving effected by constructing ample sidings. Besides, the men get worn out with long hours on the road and can hardly be expected to retain a lively interest in coal economy when in this condition. It is probable that this causes more complaint among the men, and is responsible for more waste of coal than many of the other counts put together.

5. In effect, the results of short runs, with turning, standing, etc., can be compared with section 4, and similar reasons apply. Short runs cannot always be avoided, but should be reduced to a minimum. Conditions of traffic are generally responsible, although existing facilities for caring for engines often contribute largely.

6. This may seem contradictory, as compared with section 5, but will be evident upon thought. Some coals clinker and choke up much more readily than others. Sulphur is responsible for much trouble in preventing the proper working of the grates, and a dirty fire is hard on the coal pile and the flues. The most economical length of run depends upon conditions which vary with each case. Engines have been run from 500 to 800 miles without stopping to make a new fire, but the coal must be of suitable quality. Some fuels will make a run of 200 miles almost an impossibility by the distress caused to boiler and fireman. Unfortunately, it is often impossible on account of local conditions to graduate the runs to suit the fuel, and the best results are not obtained.

7. Care in making up trains and thought upon the part of the train crew can do much to remedy this waste. If cars destined for a portion only of the run are placed next to the engine they can be pushed into sidings without moving the whole train. Switching by road engines can also be cheaper done by leaving the train standing on the track. This may entail more work for the conductor, as the cars switched are far from the caboose, but it is certainly an economical proceeding to which too little attention is paid.

8. Making up lost time is generally considered the essence of good management and operation, and it is not our intention to dispute the fact, but it is extremely wasteful of coal. By wasteful we mean that it requires more fuel per ton-mile, or train-mile. The reasons were discussed under section 3, and need not be repeated. Railroads will always make up time when possible, and will be expected to do so, and the coal pile will have to suffer. The best we can do is to endeavor to obviate the necessity for making up time by keeping steadily to the schedule.

9 and 10. Credit is seldom allowed the locomotive in the performance sheet for work of this nature, but when we see the gage recording 70 or 80 lbs. on a heating or dynamo pipe, the valve wide open, and the trainmen crying for "more steam," we realize the extra work thrown upon the boiler and coal pile, without any credit therefor. Twenty 16-c.p. lamps in each of a train of eight cars would require about 20 h.p., and the heating of these cars about twice as much more. While 50 h.p. seems small in comparison with 1,000 or 1,200 used by the engine, it is a constant drain, down hill as well as up, and may represent from 5 to 10 per cent. of the boiler performance—and the coal pile.

11. The general use of air-braked freight cars is another item involving fuel consumption. When the pipes and fitting of a 50 to 75 car train are leaking—and how common it is to hear the suggestive sizzle when walking past a charged train—the pump must be run to make up for this direct loss, and this requires steam. This is also maintained running and standing, and is a continual drain upon the boiler, but seldom considered. Careless and improper manipulation of the brakes will also use steam—over reductions and emergency applications unnecessarily made all assist to increase the coal bill—a little only, it is true, but there are so many leaks that they sum up to quite a large amount in the aggregate.

12. Under this heading numerous counts can be made, and most of them well understood by enginemen, but often neglected. How much easier to "let her blow off" than to close the dampers or start up the injector. Circulars, letters, addresses, all are used to interest the men and keep the subject always before them, and comparative personal records are kept, but the method of making these out often vitiates their usefulness.

As stated above, comparisons between trains of different class and speed are useless as far as coal statistics are concerned, and may discourage the men instead of interesting them, if not properly deduced. Besides such an obvious waste as blowing off, there are many leaks from which the coal pile suffers. A light fire is generally more economical than a heavy one. The proper regulation of the dampers (a thing too often neglected), firing to distribute the coal uniformly, judicious use of the injectors and heater, running by the reverse lever instead of the throttle, carrying water to prevent priming, avoiding taking on so much coal that a portion rolls off on the track, coming into a terminal with just enough fire to take the engine to the house, prevention of smoke, all these result in saving fuel, but require constant vigilance and continued interest to promote. Traveling engineers and firemen are productive of much good, as well as engine riding by motive power

officials, but complete harmony between the engineer and fireman is no doubt productive of the most benefit.

13. Poor conditions of engine and boiler can produce more loss in fuel than even indifference on the part of the enginemen, and the worst feature is that it fosters the latter. Leaky flues and fire-boxes, stopped up flues, valves out of adjustment, leaky steam pipes, blowing packing, worn cylinders and valves, all cause an incessant and costly drain on the coal pile. Insufficient time or attention in the roundhouse, or improper work reports by the engineers, or combinations of these, are responsible for the wasteful condition outlined, and if an engine crew desires to perform its duty, it is impossible to made a good record with such odds against them. These conditions are more likely to exist when pooling is in vogue, and where this practice is followed, too much care cannot be given to the exaction of work reports and the supervision of this work to insure its proper performance.

Attempts to make excessive mileage between general repairs are often responsible for the above conditions, representing false ideas of operating economy.

14. While the transportation of empty or lightly loaded cars is a necessity, it has its influence upon the coal consumption in that more power and, therefore, more fuel, is needed per ton-mile than with fully loaded cars. For empties this has been estimated at an increase of 30 per cent. on the level, but as grades are ascended, and the effect of gravity increases, the increase in power needed per ton-mile due to the cars being empty diminishes. Diagram No. 2 illustrates this point, and shows the excess power needed for empties on various grades.

Having considered the various causes for an increase in the use of coal, it is evident that to keep its consumption down to a minimum requires the hearty co-operation of the various departments and classes of employees. The motive power department can do much in the design of locomotives and selection of equipment, the facilities afforded at the roundhouses and terminals, and in the "esprit du corps" of its members, but the transportation, and sometimes the traffic, departments can give much assistance without interfering with their economical operation.

Perhaps the best way to promote this feeling of co-operation and to establish a "community of interest" is to call together enginemen, roundhousemen, trainmen, despatchers, and the various classes connected with train operation and care of locomotives, in a joint meeting. The presence of motive power and operating officials, who will make addresses upon the topic to be considered, is essential to get the subject fairly started, after which the men should be encouraged to express their views and quote recent instances in which a different treatment would have resulted in economy, and such discussions can progress without anyone feeling personally attacked, and matters will be brought to light which, if followed up, are productive of much good. The fact of calling the men together for general consultation is almost sure to promote a good feeling between all parties, and too much value cannot be placed upon this.

(To be concluded.)

The Long Island Railroad Entrance to Manhattan.

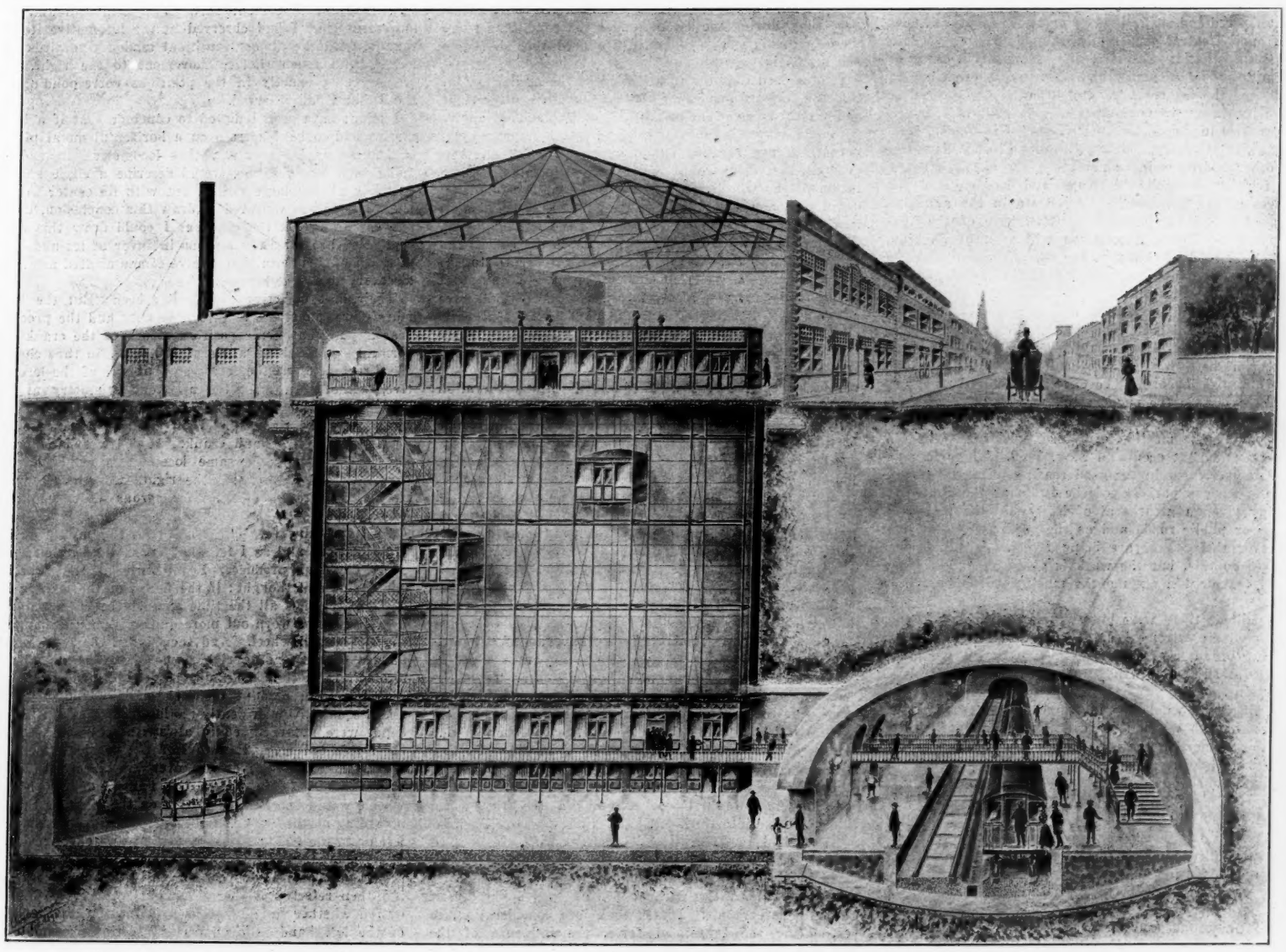
The present status of the Long Island Railroad's East River tunnel project is that plans are completed, both for the tunnel and for the very serious matter of the terminus in Manhattan, and the work is awaiting the franchise terms from the city commissioners. The expectation is that the franchise question will be taken up by the new administration, as soon as possible after January 1, and it is thought that all concerned will be interested in bringing to a working basis a project so obviously expedient as a means of lessening the congestion of transportation facilities in the city.

The corporate name of the organization which is to connect Long Island City with Thirty-third street, Manhattan, by tunnel, is the Long Island Extension Railroad Co. It was incorporated in New York, June 18, 1901, with a capital stock of $1,000,000, to build a double track electrical railroad from the Long Island Railroad to New York City. Samuel Rea, Fourth Vice-President of the Pennsylvania, was subsequently elected President, and F. E. Haff, Secretary of the Long Island, Secretary and Treasurer.

The tunnel will start at grade at Thompson avenue, Long Island City, run under the tracks at the Borden avenue station, and thence under the East River to a terminal station at Thirty-third street, close to Broadway. This station is unique in several particulars. A great part of the crowd which now goes to the Thirty-fourth street ferry, will be handled with a street frontage of 45 ft., on a lot 98 ft. 8 in. deep. Lots Nos. 49 and 51 West Thirty-third street furnish the frontage and supply ample room for a battery of elevators which will convey passengers to and from the actual station, below street level. This station will be much larger than its Thirty-third street approach, and will be two stories in height, outward bound passengers alighting at the upper story and crossing the tracks by means of a bridge, as shown in the illustration. Inward bound passengers will take the elevators from the lower story, so that there will be no mixing of the crowds.

The company has no present intention of building an underground road to Seventh avenue, as originally proposed in the application. A change of plan caused the refusal of this privilege by the Rapid Transit Commission. But the East River Tunnel will pass underneath the Rapid Transit Tunnel at Thirty-third street and Fourth avenue, and connections are to be established at this point which will facilitate the ready interchange of passengers.

According to present plans the tunnel will be from 70 to 80 ft. below the level of the street, and will require two and a half years for its completion. Work will be simplified by the fact that interference with sewers and water mains will be obviated at this depth. It is expected that ground will be broken next spring, at which time the various contracts will be ready for letting.



Proposed Manhattan Terminal of the Long Island Railroad—Thirty-third Street, Near Broadway.

The Results of the "Good Roads" Trains.

As the reader will remember the Illinois Central, some months ago ran a "good roads" train through a considerable part of the territory which it serves, and the Southern Railway is now carrying on a similar enterprise. A few weeks ago we asked for information as to the observed results of the Illinois Central train and Mr. Harahan, Second Vice-President, sends the following account:

The benefits resulting from the good roads train run by the Illinois Central Railroad recently, in connection with the National Good Roads Association, through several States, are being felt in a different manner, owing to the different conditions prevailing in the different States.

In the State of Kentucky, where several stops were made, the turnpike roads in the interior having been model roads for nearly 75 years, or perhaps longer, Kentucky having been the pioneer State in the building of such roads and the national government having encouraged such work, the improvement to be effected is not so great as that in other States. Part of the Great National Road, that was designed to extend from Washington to New Orleans, was built in Kentucky from Maysville to Paris and is still kept up in splendid condition by the State, not by the United States Government, the work of internal improvement by the United States having received a quietus under Andrew Jackson. There has, however, been organized the Kentucky Good Roads Association, which has taken hold of the matter

with considerable spirit with the intention of improving roads in sections of the State where they are not up to the standard.

In Tennessee following the convention held in Jackson, Tenn., on Thursday, June 20, 1901, the Tennessee Good Roads Association was formed and subsequent to the trip of the train through the State of Tennessee a convention was held at Nashville, which was fairly well attended by people from different portions of the State. Recommendations were made to the Legislature to be presented at its next session to be held in Nashville in January, 1903, and while no active progress has been made in regard to county action upon this matter, the interest in the matter of good roads will be continually agitated, and will undoubtedly produce good results.

In Mississippi at a recent meeting of the State convention of Supervisors at Jackson, Miss., the good roads train and its fine work were frequently mentioned, and the statement was made that some 20 counties of Mississippi had already passed from the old method of working public roads to the contract system. The executive committee created by the State convention of Supervisors of Roads was charged with memorializing the Legislature for more progressive lessons along the lines of building and maintaining public highways, as people throughout the State were alive to the importance and necessity of this matter. The good roads convention held in Jackson, Miss., as a culmination of the good roads county conventions of some months since, started this matter in Mississippi and the Good Roads Association organized as a result of that convention, will also memorialize the Legislature with the intention of having a conference held between the representatives of that organization and of the State convention of supervisors, so that an agreement may be reached to work in harmony to the desired end. The impression seems to prevail that the Illinois Central good roads train did lasting good in this State; that it created a fine sentiment in favor of the improvement of public highways and fostered among the people the determination to do better by themselves in the future by the enactment of laws that will compel the counties to spend some money on public roads. Gov. Longino, of Mississippi, took high ground in his inaugural and other addresses in pointing out the absolute necessity for better public highways and has enlisted the services of the best men of the State in the agitation for good roads. The executive Committee of the Mississippi Good Roads Association will meet at Jackson, Miss., on Dec. 4 of this year for the purpose of framing a good roads law to be presented to the next session of the Legislature for passage.

In Louisiana there is an active movement for the formation of local good roads associations, the president of each of which local association is to be ex-officio member of the State Good Roads Association. This complete organization should be effected within the next 60 days. It is then the purpose to call a meeting of these delegates in New Orleans for the promotion of good roads work before the meeting of their Legislature, which is biennial and next occurs in May, 1902. There is a decided improvement in the good roads sentiment throughout the various parishes of the State as the State has already given a great deal of leeway in the matter of taxes for public roads and as the good roads sentiment improves these taxes are being levied. It takes some time to do this, but the work is going on and it is believed that within six months much good work will be done.

In Illinois there were but two stops made and, owing largely to the extreme heat and dry and dusty character of the roads to be worked over, the experiment was not as successful as it would have been under more favorable conditions.

Taking as a whole the information from the different States through which this good roads train passed it is fair to assume that the movement is well started looking toward the improvement of the roads and the more intelligent and consistent method of road building. This work is largely for the future and it will take some time before practical results can be produced that would demonstrate whether the trip of the good roads train over the Illinois Central Railroad was a conspicuous success or not. At the present writing it would seem to have been a success.

Unsymmetrical Movement of Locomotives.

The reporter on the question of the creeping of rails, for the International Railway Congress, was Baron Joseph Engerth, Chief Engineer of the Austro-Hungarian State Railroads. In his report and in the discussion which took place in Sections I and II of the Congress, after the report was presented, Baron Engerth brought out the notion that the chief cause of rail creeping is the unsymmetrical movement of the locomotive. He says that it has been noticed that the left hand rail creeps more than the right hand rail. The observations leading to this conclusion have generally been made on double track railroads where the trains run on the left hand track; but on the Austro-Hungarian State Railroad the trains run on the right hand track and still the left hand rails creep most. Baron Engerth says that it was observed that this advance of the left hand rail was on roads where the locomotives have the right hand crank leading the left hand crank. He has observed also that in cases where the right hand rail was discovered to have crept most there was in use a large number of locomotives with the left hand crank leading. So he concludes that the great cause of rail creeping, and specifically the cause why one rail creeps faster than another, is the sideways oscillation of the locomotive acting unsymmetrically according as one crank or the other leads.

The development of Baron Engerth's idea we shall probably print more at length in a later issue, but we confine ourselves now to presenting the remarks made on this subject by Mr. Herdner, of the Southern Railroad of France, whose contribution to the verbal discussion of Baron Engerth's report follows at considerable length.

Until lately my attention has never been drawn to the possible connection of cause and effect between want of symmetry in the locomotive and the unequal creeping of the rails. The first time my attention was drawn to this point was by an article by Baron Engerth, published in the *Organ*, in, I think, 1896.

As far as the want of symmetry of the locomotive in itself is concerned, I acquired a very good notion of it in the course of some observations, which Mr. Engerth's paper has recalled to my mind. These observations were made about 1883, on the Pau-Laruns line, soon after it was opened to traffic. On this line there is a continuous ascent of 2 per cent. over a length of seven to eight kilometers. At the period which I am referring to, the line was new and in perfect adjustment, and consequently under favorable conditions for observations, as its influence on the movements of a locomotive was reduced to a minimum. The trains were hauled by locomotives with six coupled wheels, having outside cylinders overhung to the front, a fire-box overhung at the back, and a rather short wheelbase. The weights hauled by these locomotives were such that on the ascent referred to, and with a cut off of 25 to 30 per cent., the speed did not exceed 30 to 35 kilometers (18.6 to 21.7 miles) per hour. They were thus, during the ascent, under the conditions when sideway oscillation is generally produced very definitely and regularly.

I recognized that the total period of the oscillation included a forward movement of the locomotive to the right and a return movement to the left, and coincided exactly with one revolution of the wheels. This appeared abnormal to me, because I had supposed, on theoretical grounds, that there would be two periods during one revolution of the wheels. Finally, I observed the following definite phenomenon: Almost regularly the locomotive in moving forward came in contact with the left hand rail, then moved at a certain moment towards the right hand rail which it barely touched, and then returned to the left again, so that if I had drawn the path of any point in the front part of the locomotive, that path would have consisted of a series of straight lines of equal length, sloping towards the left, interrupted by short straight lines to the right; the line to the right together with one straight line to the left corresponding exactly to one revolution of the wheels. This was the first observation which showed me the want of symmetry of the locomotive, and I at once proceeded to investigate the causes of this movement.

The method employed was as follows: In the first place, I determined the moments of the exterior forces acting on the locomotive, these moments being estimated in relation to the vertical axis through its center of gravity. The only moments to consider in the case are those of the tangential forces at the contacts between the rails and wheels. These forces vary of course with the position of the cranks.

Now here a first difficulty arose. It was necessary to know, when the steam actuates a pair of wheels through an outside crank, whether the work produced is transmitted exclusively to the wheel on the crank side, or whether the corresponding wheel on the other end of the same axle also does work; in other words, whether the work due to the steam merely produces tangential force at the rail contact on the same side, or whether similar forces are produced on both sides. After investigating the subject, I arrived at the opinion that the nearest wheel did the whole work as long as the limit of adhesion of that wheel was not reached, and that the other wheel did not come into work until that limit was exceeded.

As I had to do with a locomotive with six coupled wheels which was not deficient in adhesion and as the load was not an excessive one, I was able to consider each side separately without having to trouble myself with the other side. I then took into consideration, in estimating the tangential force, the influence of the inertia of the different masses which moved relatively to each other.

Finally, I took two rectangular coordinates, plotted the angles of 0 to 360 as abscissæ, and as ordinates the moments estimated as stated above; the moments which tended to movement to the left I assumed to be positive and those to the right, negative. In this way I obtained two curves, one for each side of the locomotive. By combining them, I obtained a sinusoid, the ordinates of which gave for each position of the cranks the value of a moment, positive or negative, which resulted from the joint action of the steam and of the inertia of the moving parts.

This curve enabled me to apply the general equation of a body rotated round a fixed axis. You know that this equation expresses that the angular acceleration is equal to the sum of the moments of the external forces divided by the moment of inertia. Hence, by integrating I could obtain the curve or a curve of angular velocities, and then by integrating a second time I could obtain a curve of the path of a point situated at any desired distance from the vertical axis of the locomotive. This latter curve was a sinusoid with an ascending and descending branch for each wheel revolution.

Now this sinusoid showed that the locomotive had an almost constant tendency to deviate towards the left. Its general direction was away from the axis of the abscissæ; in other words, the descending branch was very short, whereas the ascending one (where the ordinates were increasing) was very long.

I did not attach undue importance to this result, which I could consider only a preliminary one.

In the first place, I had not been able to take into consideration all the forces which come into play. Allowance should have been made for transversal friction; I mean the friction which opposes the rotation. For there are two components of the tangential force which have to be considered; that which acts *in the plane* of the wheel, and which is nothing but the adhesion of the wheel which is utilized, and that which is *perpendicular to the plane* of the wheel. But what is the relative value of these two components, for each wheel? And, moreover, how is the adhesion utilized distributed between the three coupled wheels on the same side? Of this I know nothing.

Then the *direction* in which the friction acts should also have been taken into consideration. The friction is always in the direction opposite, not to the force producing the movement, but to the movement itself. Now, I did not know the direction of the movement, for I could not determine it until after a second integration. Hence, I had to decide to neglect the transversal friction.

Finally, in both of my integrations, I required a constant. In each case I have taken it equal to zero, simply because I had no good reason for doing otherwise.

In spite of all these doubts, I could not fail to be struck by the agreement between my sinusoid and the movement that I had observed in the locomotive itself; that is, with the almost continual tendency towards the left with a much shorter movement to the right, the cranks being exactly in the positions corresponding to those that I had observed.

I might have been tempted to conclude that if a locomotive had to haul a train on a horizontal metal plane, of sufficiently large extent, that locomotive, instead of going in a straight line, would describe a circle having probably a very large radius, but with its center to the left. I have not ventured to draw this conclusion, but I have at all events thought that I could draw this one; that there are certainly reasons in favor of it; and it is in this modified form that I have communicated my little discovery to my colleagues.

Their first objection always has been "But the locomotive is symmetrical!" No it is not; and the proof is that if you change the position of one of the cranks by turning it through an angle of 180 deg. you thus change the direction of all the forces on that side of the locomotive, without changing the apparent symmetry at all. Thus the locomotive is not symmetrical. On all our locomotives the right hand crank has an advance of 90 deg. over the left hand crank. If the left hand crank had this advance, the same locomotives would have a tendency to move towards the right, instead of towards the left; instead of being *levogyrous* they would be *dextrogyrous*.

As I was, however, but little satisfied by my theoretical investigations and as I felt that I was working on somewhat doubtful premises, I returned to the practical standpoint and thought; if the flange of the leading left hand wheel rubs all the time against the left hand rail, it must become worn out more quickly than the flange of the right hand wheel. And then I had the wear of the flanges of the leading right and left wheels of all the locomotives of the Tarbes depot examined. It was found that the total amount of wear on the two sides was about equal. Now evidently the locomotives of the Tarbes depot were not occupied in always ascending the 2 per cent. gradient from Pau to Laruns; most of the lines which these locomotives ran over are lines with many curves and gradients, and the flanges of the leading wheels would become more worn on the right or the left according as the center of the curve run over was to the left or to the right; so much so that any effect produced by a short section of special character would become hidden and obliterated by the total effect produced.

I then referred to the permanent way service and inquired whether it had not been observed that the heads of the left hand rails on certain sections became more worn than those of the right hand rails. But in order to observe any such difference in the wear, it would have been necessary to have a track over which trains always ran in the same direction, and moreover always at slow speeds; for at high speeds the sideway oscillations are no longer regular; it would thus be necessary that such a line would satisfy all sorts of conditions, and, at least at the time of which I speak, no such line was in existence on the Tarbes railroad. The answer of the permanent way service was accordingly in the negative, and it is clear that it could not be otherwise.

It did not occur to me, nor did it occur to the permanent way engineers whom I consulted, that the unequal creeping of the rails could be due to the want of symmetry of the locomotives. I, however, thought that if the locomotives did more work on the right hand side, that side of the frame would be more fatigued, and I then collected data, which showed that the right hand side of the frame had a greater tendency to fracture than the left hand side.

I remembered these data when last year our permanent way service applied to me for several particulars to

enable them to answer some of the points in Baron Engerth's detailed list of questions. I then collected fresh data, at the Bordeaux workshops, as to the repairs carried out on the frames of all the locomotives of our railroad; these data extend over a period of five years. The data showed that the number of right hand fractures exceeded that of the left hand fractures by 25 per cent.

This greater frequency of right hand fracture is thus, as I have stated, the only item I have found, among observations made in actual practice, to confirm the theory which I sought to base on the want of symmetry of the locomotives.

Several years later, however, my attention was drawn to the unequal wear of the rolling surfaces of the left hand tires, which also was recorded by Baron Engerth. This unequal year was observed, not on the leading wheels, but always on the driving wheels. I found that with our express locomotives and our locomotives with six coupled wheels and outside cylinders, the tire of the left hand driving wheel showed abnormal wear at the part which touches the rail when the crank has just passed its anterior dead point. In order to show this peculiarity, I had diagrams made which I regret not to have brought here with me. They would have shown you that the flat produced is a little less than 90 deg. from the left hand crank; that no such flat is found on the left hand coupled wheels or on the right hand wheels; and that in all cases the unequal wear of the tire of the right hand driving wheel is much less pronounced.

These observations were made in 1891; for I recollect that at that date I happened to be on the Lyons line, and I asked the engineers of the Dijon section whether they had made similar observations. Their answer was in the negative.

I thought later on to connect these phenomena with the theory of the want of symmetry of the locomotives, and I had thought of working out their explanation. Only this would involve very much work, and it seemed to me that the question did not possess any but a speculative interest; nor did it particularly bear on the safety or on the economy of the traffic. I therefore did not continue the investigation.

Nevertheless, it seemed to me that these observations, although already very old, would be of interest to engineers studying the questions connected with the want of symmetry of locomotives. They will, in any case, form records useful for those who desire to elucidate the question further.

New 80,000 lbs. Capacity Box Cars for the Chicago, Burlington & Quincy Railroad.

The Chicago, Burlington & Quincy has ordered 800 wooden box cars of 80,000 lbs. capacity from the Pullman Company, which will be built as shown in the accompanying drawings. These cars represent the latest practice of the Burlington. The leading dimensions are: Length over end sills, 41 ft. 8 in.; width over side sills, 9 ft. 1 in.; length inside, 41 ft. ⅜ in.; width inside, 8 ft. 6⅛ in.; from floor to top of rails, 3 ft. 9¼ in.; from floor to carlines, 8 ft., and length of wheel base 36 ft. 8 in.

The long sills and flooring are to be Norway or long leaf virgin pine, the siding white pine or fir, and the inside lining common yellow pine or Norway pine fencing material. White oak will be used for end sills, posts, braces, carlines, end plates, side and end girths, buffer beams, door frames, sills under doorways and ladder posts.

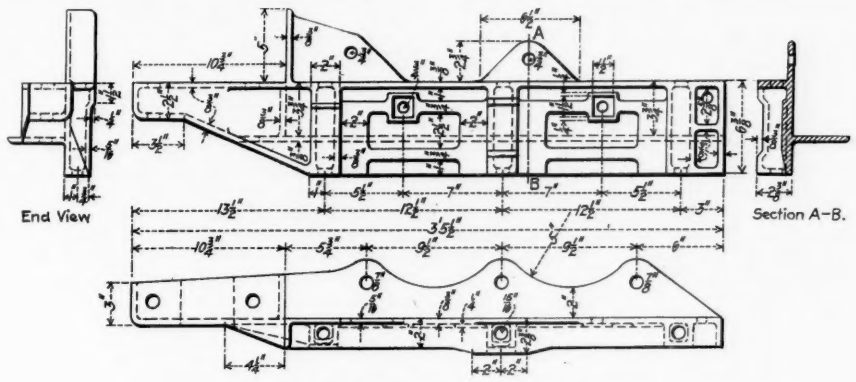
The long sills are 5 x 9 in. and the end sills are 7 in. deep and 10¾ in. wide. The side and intermediate sills are connected to the end sills by malleable iron sill pockets, requiring no mortises or tenons. The center sills are connected to the end sills through extensions of the malleable iron draft gear castings. The main body of the casting is attached to the center sill, and the extension projects under the end sill and is bolted to that sill. One tenon is used at the end of each center sill. The posts and braces are set in suitable malleable iron pocket castings and the carlines are connected to the plates through malleable iron pockets. Chicago metal roofs are used.

In place of the usual wooden needle beams, 8-in. deck beams are used and the malleable iron posts for the trusses are made to fit those beams. This construction is shown in detail. The ends of the car are strengthened against bulging by truss rods.

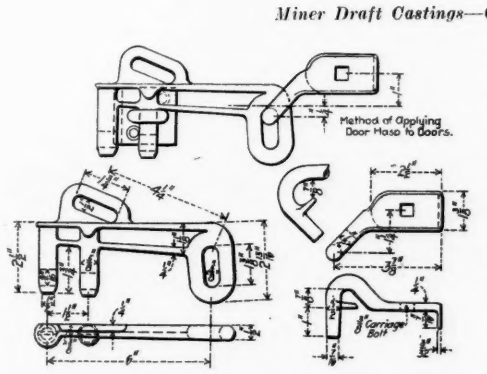
Miner draft rigging is used and the malleable iron draft sills are designed to bring the line of draft on a level with the bottom of the center sills, thus reducing the bending moment at the body bolsters. The use of the shallow end sills enables this construction to be used without cutting the end sill at the coupler. As will be seen from the detail drawing of the draft sills, each sill has a strong shoulder which butts against the wide end sill, so that pulling strains are transmitted directly to the end sills and distributed by the truss rods of the car. A projection of the draft sills extends under the center sills and takes the vertical bolts.

The details of the door fastener, known as the "Prairie," are shown. This fastener is standard on all Chicago, Burlington & Quincy box cars and is handled by the J. S. Toppan Co., Chicago. It will be seen that provision is made for fastening in three positions: Sealed with the door closed; sealed with the door left partly open for ventilating purposes, or locked as on bonded cars. In the drawing, the door is in the closed position and the seal is put through the slot in the tongue. In the second position the outer tongue is inserted in the staple, and as used on bonded cars the slot in the hasp is put over the staple. The device is quite simple and is considered to be as near burglar proof as any car seal can be made; the seal must be destroyed before the door can be opened.

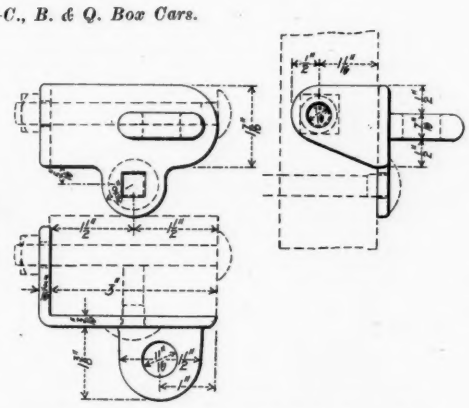
The trucks are of the arch bar type with 13-in. channel spring planks. Simplex bolsters will be used on one-half the cars and Bettendorf on the other half. All the cars will have Westinghouse air-brakes, Tower cast-steel couplers and McCord journal boxes, and the car bodies will be painted with Prince's mineral brown paint.



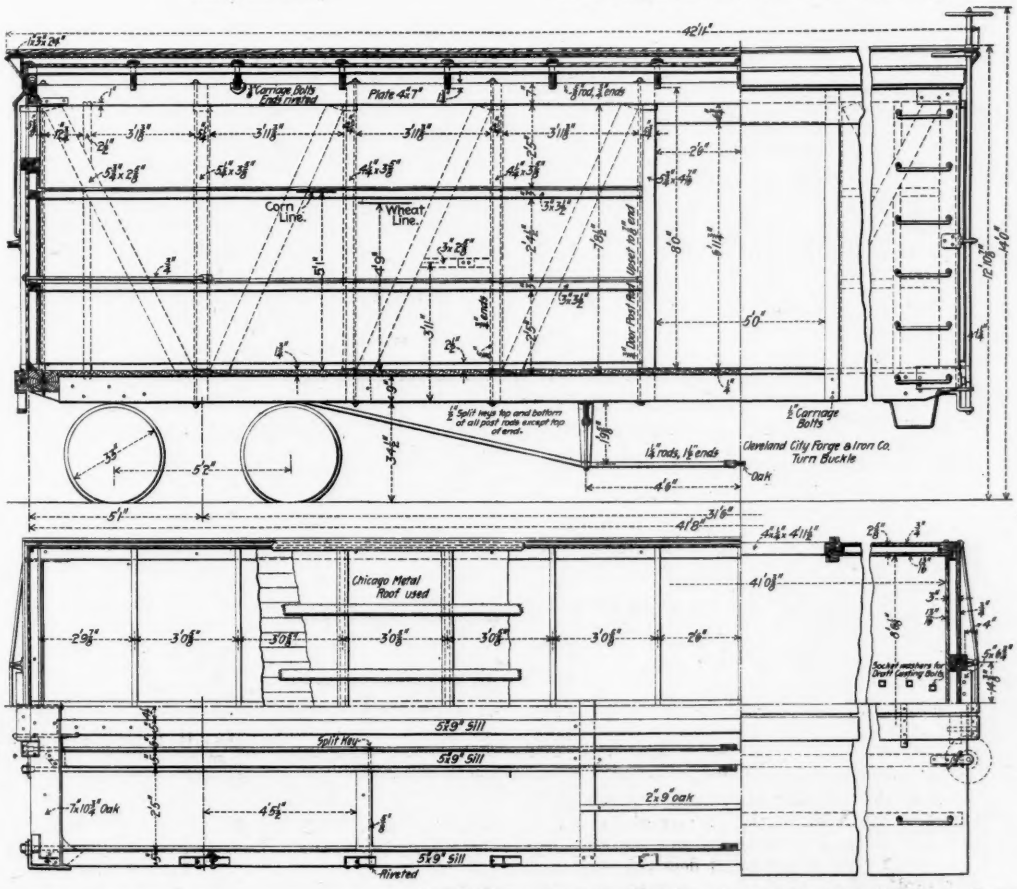
Miner Draft Castings—C., B. & Q. Box Cars.

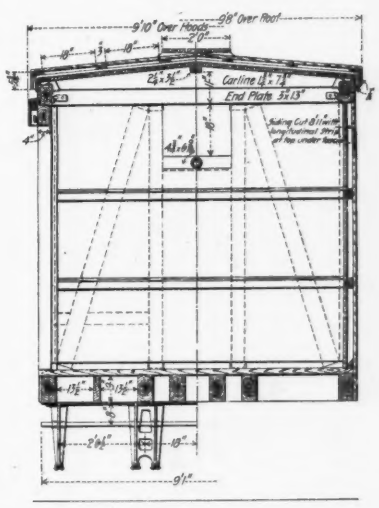


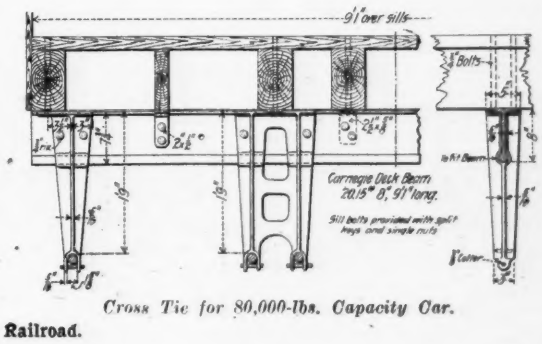
Car Door Hasp.



Door Staple for Use With 3-in. Door Stop.







Cross Tie for 80,000-lbs. Capacity Car.

80,000 lbs. Capacity 40 ft. Box Car—Chicago, Burlington & Quincy Railroad.

The Care of Air-Brakes.

We printed last week (pages 819 and 820) the papers presented at the Western Railway Club on the Maintenance of Air-Brake, prepared by Messrs. E. M. Herr and T. W. Demarest. The discussion was of a good deal of interest and quite copious extracts therefrom are printed below.

Mr. E. M. Herr, General Manager, Westinghouse Air Brake Co.—We are now fast arriving at the time when the air-brake installed in the past five years will have to be taken care of. The care of the train pipe and its connections seems to me the vital problem. The triple valve is a vital part of the brake, but you can cut it out and go along with the other triple valves. You can cut several of them out, but you cannot cut your train pipe out; and moreover a defect in the train pipe brings difficulties in handling brakes, and gives no end of trouble, not only with handling brakes but with furnishing supplies of compressed air. So special stress should be laid upon the necessity of adopting some means of systematically keeping the train pipe and all its accessories in first-class repair.

The action of the Master Car Builders' Association in increasing the charge for cleaning triple valves and brake cylinders will have the desired effect in getting the cleaning done. The next point is the maintenance of the train pipe. When we consider that more than two and a quarter times as many freight brakes have been installed in the past five years as had been installed in all the previous history of railroads, it makes us realize somewhat the magnitude of this problem.

Mr. R. D. Smith, Master Mechanic, Chicago, Burlington & Quincy.—I have been particularly interested in this work of cleaning triples and cylinders, and caring for air-brakes, and I have been working in this direction for some time. It is something like three and one-half years ago that I began to see the importance of having some systematic way of doing the work of caring for the triple valves, and we started out first by taking a handy man and having him, with some of our experts, take a valve apart. In this way he became familiar not only with the different parts of the valve but its functions, and he is still doing this work, and has developed into a very excellent man. From this small beginning we have developed what we call a triple valve repair shop, and it is pretty well equipped for doing the work of cleaning and making proper repairs to the triple valves and the angle cocks and the pressure retaining valves that may be brought there for repairs.

Our method of handling the triple valves is that we have a number of extra ones, and all triple valves for repairs are brought to the central point for repairs, as recommended by Mr. Herr in his paper. When the triple valves are brought into this place they are taken apart, every part of them is thoroughly examined and cleaned, the valve has necessary repairs made to it, is put together, put on a testing rack in this air-brake room, and is tested by the man who has done the work. From that place it is taken by a laborer to another shop in another building, and is put in the hands of a man who does nothing but test the triple valves, according to the test that we have laid out for him. If the triple valve passes these tests it is stenciled and taken to the depot by the man who has charge of the work. On a certain train every day he sends so many valves to each one of the different yards, where they are taken by the man who has to do the work under the car. This man's duties are to begin at the gasket on one end of the hose and follow up through the hose, the angle cock, all along the train pipe, and in that way clear to the opposite end of the car. When that is done, and he has tightened up the joints, he takes out the piston from the cylinder, he cleans it and oils it with a small portion of a grease that we buy for that purpose, puts the piston back and takes off the triple valve and replaces it with the one that has come from the testing plant, taking the same wooden blocks that are in the openings of the triple valve from the testing plant and putting them in the valve that he has taken off. If the brake has been cut out by a trainman and a card has been applied, this card is folded up and put into the check valve case, so that we are enabled to keep a record of about what the trainman thought was wrong with the valve when he cut out the brake.

It may be interesting to know how this work has increased with us at just our home point. I will give you a list of the number of triples that we cleaned, beginning with September, 1900, to October, last month. In September, 1900, we cleaned 528 valves; October, 563; November, 547; December, 624; January, 586; February, 447; March, 757; April, 784; May, 879; June, 925; July, 1,007; August, 925; September, 946, and October, 1,116. The fluctuations in numbers are due in part to weather conditions. For instance, in some of the winter months it is a pretty difficult matter for a man to work under a car out of doors, and do as much of it as he can do in some of the spring and fall months.

Mr. Herr speaks of the hose coupling, and says that it was never designed to be pulled apart in ordinary service. I quite agree with him, but I do not know what he is going to do to help the matter. Every time that you speak to a man about it he comes back at you with either one of the arguments that Mr. Herr mentions, or by telling you that the Interstate Commerce Commission does not permit them to go between the cars to uncouple even the hose. I agree with Mr. Herr in his conclusion, that if this is not changed, a change to a hose coupling which can be pulled apart without damage must be made. I hope that he will give us something in that line.

He also speaks about making a careful record of pump repairs. I do not know what is done on other roads, but with us when the pump fails we take it off and repair it, and from what I have learned from other people I believe that is the general practice. It seems to me to be a bad one, and I believe that we must soon go to the point outlined by Mr. Herr and have some systematic care of the pump.

In neither of the papers was any mention made, or any recommendation, as to the proper care and oiling of the brake cylinder. This is important, because it is the practice at some places in oiling cylinders to take out the plug and pour in an amount of oil that will run through a given opening, depending on the kind of weather and the oil that they use as to how much goes in the cylinder. It seems to me that this is wrong, and that some systematic care ought to be given to the cylinder as well as to the triple valve.

We have test plants in all of our important yards at Chicago, where we get air from pumps or from a compressor, and after a triple valve is put on a car it is thoroughly tested and tried for leaks all through the train pipe and the branches.

Mr. W. H. Marshall, Superintendent Motive Power, Lake Shore & Michigan Southern.—I would like to ask what the experience has been of the railroads in attempting to get all air-brakes repaired and cleaned within the 12 months; that is supposed to be the interval of time. When we first went into the matter and began to clean and repair our own air-brakes as the cars came upon the repair tracks, we found that instead of maintaining the brakes at the rate of 20,000 sets a year we were maintaining them at the rate of about 10,000 or 11,000 sets. Before the prices were changed for this work at the last convention, we had made up our minds that if we were going to do our share of the work we had to do it on the foreign cars, as well as our own, and trust other people to get after our cars when they were on their roads and do the same to ours as we were doing to theirs. We began that, and the prices were changed almost immediately, so that we would come out whole on the matter. But now the rate is about 19,000 cars a year when we own slightly more than that, so that with our present efforts in cleaning and repairing triples and cylinders and all the brake apparatus on a car in every car needing it as it goes on the repair tracks, we do not quite maintain our equipment. In order to get at a sufficient number of cars it looks as if under the conditions on our road we have got to pipe more than our repair yards; I am sorry to say these are not all piped yet. But I would like to know what the experience of the members is in that respect. In one case in Chicago here we are putting pipes to the tracks at the transfer house, so that as the car stands there we can get at it for this air-brake work.

Mr. C. A. Schroyer, Superintendent Car Department, Chicago & North Western.—To-day we have nine men steadily employed in cleaning triple valves. We have established several places for doing this work. On the Wisconsin Division we do it at Chicago; on the Northern Division we do it at Fargo; on the Western Division we do it at Clinton; on the extreme north we do it at Escanaba and Ashland. Triple valves are removed from the cars and sent to the central plant for cleaning. We do not depend on the cleaning that has heretofore been done under the cars, because we know it cannot be done and done properly.

The greatest cause of the failure of brakes under freight cars is the fact that we are allowing hose to hang down without any means of closing the end. The valves that we take off the freight cars, sent in for repairs, we find almost invariably to be perfect, except that the dust and dirt that has collected in them has clogged the piston ring and has filled the whole thing to such an extent that it becomes inoperative from dust and dirt rather than from wear. The dust that gets in absorbs the oil, so that after a while there is nothing to lubricate the valve with, and I believe that that is the greatest source of trouble to-day in handling triple valves.

We endeavor to clean our valves and brakes, the brakes as well as the valves, once a year, and I have been making comparisons between the valves that are taken out of the passenger cars and those removed from freight cars. Our valves will go along very nicely on a passenger car for six, eight, nine or 12 months without cleaning and work perfectly, simply because when a passenger car is going over the road the hose is coupled; a freight car in the same time will be plugged up with dust.

The greatest trouble that we are having to-day, on account of the failure of brakemen to uncouple hose, is the rupture of the hose and the breaking of the train pipe right back of the angle cock. Any number of pipes with angle cocks with hose attached to them can be found in our switching yards, that are broken at that place, on account of a failure to uncouple the hose, and we lose more in that than any other one thing.

When we established the practice of having triple valves sent to a central plant for cleaning, we considered that we would have everything put in good order that goes through our repair yard. We found that in the course of about three or four months the same cars were coming back to the repair yard, and that is the way it continued right along, three, four and five months. The newer and better class of equipment does not come into the repair yard, and we have had to look out for other places at which to do this work, so that we have taken team tracks and warehouse tracks and freight house tracks, any place that we can get, near to where the cars stand all day, and they will give us a chance to do that work, and in that way we are cleaning to-day from 750 to 900 cars a week, and we ought to get over that all right. We do certainly notice a very marked improvement in the condition that the brakes are in and the manner in which they are working.

Mr. S. J. Kidder, Westinghouse Air Brake Co.—Mr. Herr takes the position that the first thing to do is to maintain the train pipe and its connections and prevent the leakage, and if such is done, that the present size of pump is perhaps able to supply all the demand. But the engineer is held responsible for handling brakes, and if we do not put the appliances in his hands by which he can handle those brakes, we cannot hold the engineer responsible. We can furnish a pump that will supply a pretty heavy leakage in the train pipe, and we may be able to maintain that train pipe pressure; but when the engineer begins to apply his brakes he has lost all control of the brakes. The moment he puts his brake valve in the running position, or in the emergency application position, he has cut off the connection from the main reservoir to the train line, and he has practically no control of the brake. Or, in other words, when he begins to make a brake application these numerous leakages in the train pipe take the control of the brakes away from him. So I think that that point should be very strongly dwelt upon, that the train pipe should be kept up with a view of giving the engineer a chance to intelligently handle the brakes and put them under his control, rather than to undertake to put a pump on that will supply a maximum pressure when the brakes are not being used.

The Nashville, Chattanooga & St. Louis states that its experience has been that while it became necessary to considerably increase the corps of men to repair and clean triple valves, it resulted in a saving from skidded wheels alone of enough to several times pay the additional help. The trouble seems to be in a good many places that I have visited, that the corps of men to do this work has not kept pace with the amount of work that was to be done. In other words, the cars have been equipped much faster than help has been put on to maintain them. If what the Nashville & Chattanooga people say is true, that the saving in skidded wheels alone will more than pay the additional help required to maintain the brakes, it would seem as if it would be a point well worth considering.

Mr. W. H. Marshall, Superintendent Motive Power, Lake Shore & Michigan Southern.—Perhaps I had better again state the point I tried to make. Assuming that you have all the force, or are willing to pay for all the force that is necessary to maintain the brakes, do you find that you can get a sufficient number of cars over the repair tracks that need cleaning in order to get over your equipment at the rate of once a year? We find that we cannot do it. How are you going to get at the remainder of the equipment? As Mr. Schroyer has said, the old cars go on the repair tracks quite frequently; the modern equipment does not. If we must adopt some other measures to get at the remainder of the cars, we must either supply air at outlying points, or warehouse tracks, or transfer tracks and other places, or we must actually switch cars in for that purpose, even though we do not know that the brakes are out of order, simply because they have not been cleaned for a year. I thought possibly some of the members had run up against this proposition and had solved it to their satisfaction. As I look at it, it means either getting air to points that are rather inaccessible, or it means actually switching out the cars at a given time, or in case the brakes have been reported defective.

Mr. R. D. Smith, Master Mechanic, Chicago, Burlington & Quincy.—We have been brought up against the same conditions that Mr. Marshall speaks of. As I explained, when we first began this work of cleaning triples we started it on the repair track. As we extended it out into the yards we found the necessity of an air plant for testing. We tried hand pumps without success, and then we finally ran a line from a main compressor as far as six miles for the purpose of testing brakes, and we find that that is the only way we can get over the equipment. As he says, it is simply impossible to get enough cars on the repair track to get over the equipment, and the work must be done in large yards where there are numbers of these air-brake cars. At least I speak from my own experience when I say that.

Mr. C. A. Schoyer, Superintendent Car Department, Chicago & North Western.—As I understand, what Mr. Marshall wants to know is this, do you get over your entire equipment, or do you get over a number equal to your equipment? Now there is a big difference in those things. What we want to do is to get over the entire equipment, not so much get over a number equal to the equipment, but we want to get every car that we possibly can, and we realize that we cannot get these cars on the repair tracks nor ask the operators to set those cars on the repair tracks for the purpose of cleaning them. The result is we have to go out on our team tracks where the cars are standing for unloading; they sometimes stand there two or three days. We go onto the freight house tracks where the cars are switched out in the morning before 7 o'clock and stand all day, and there is where we expect to-day to accomplish the greatest amount of good in cleaning triple valves. We have not every one of those places fitted up yet as we want, and it is a question with us as to how best to do it, which problem has not yet been solved.

Mr. E. M. Herr, General Manager, Westinghouse Air Brake Co.—I realize fully the difficulty with these hose couplings. It is no easy matter in the first place to properly attach the train pipe and it is still more difficult, with the present methods used by switchmen of very often pulling the hose in two, to keep the train pipe in place. The matter of pulling hose in two is really exceedingly serious, as has been brought out in the discussion. It is true, if the couplings are in good order the hose is pulled apart without damage, but it puts a strain upon the hose even then, owing to the angularity of the angle cock, which is objectionable. To answer Mr. Smith's question, as to what can be done if this practice cannot be stopped, the only solution I see is what is known as the automatic hose coupling device, a device which will enable the trains to be parted and coupled without damage. There are other advantages, of course, incidental to such a device, for when cars are equipped with it on trains standing on sidetracks it does away with a great deal of the dirt which is caused by the hose hanging down and, of course, all of the damage incident to the hose catching and dragging and all that sort of thing, as well as the vibration of it.

The magnitude of the train pipe defects is shown in Mr. Demarest's paper. I have footed them up. In the percentages in which he gives them they amount altogether to 34½ per cent.; that is, 21.2 per cent. of them for troubles with train pipe unions, which would leave a little over 13 per cent. for other difficulties incident to train pipe maintenance. And I feel quite sure that any effort that is given to a betterment in this direction will assist not only in the handling of the brakes, but in the maintenance of pumps and all the apparatus. Also, as was quite fully brought out by one of the speakers, in the correct handling of the brakes by the engineer, as it is impossible for him to handle them properly with any considerable amount of train pipe leakage.

An Indian Railroad Manager on American Railroads.

Lieut.-Col. W. V. Constable, R. E., manager of the Eastern Bengal State Railway (on furlough), recently visited the United States to report on the working of American railroads. He visited New York, Pittsburgh, Chicago, Salt Lake City, Denver, St. Louis, Buffalo, Baltimore, Washington, Cleveland, Altoona, Philadelphia, Boston, Albany and Schenectady. He left New York for England on the 13th of June last, and his report to the Indian government, dated July 23, 1901, has now been printed.

He considers that the majority of American railroads have indifferent roadbeds, but that the track itself is strong on account of the large number of sleepers. The comfortable riding is due to the excellent design of the cars.

South Boston Terminal Station is the best he has ever seen. One feature he particularly noticed at the new stations in America is the fine accommodation given for women and children.

He praises the electro-pneumatic system of interlocking and suggests that it should be tried at some of the large stations in India. He also mentions the straight electric and low-pressure pneumatic systems and thinks "manual interlocking has had its day." He remarks incidentally that the pneumatic broom will be found extremely useful in India. He was much impressed by the extensive use in America of automatic block signaling and thinks it may have to be introduced into India "by and by" for suburban traffic near Calcutta, Bombay and Madras.

As regards passenger cars he thinks the extra width, height and length of American stock an advantage over English. He is convinced that the American 75 to 80-ft. long car is safer and runs better at high speed than does the English type, 69½ ft. long over buffers. He thinks Indian railroads should follow American practice in this respect. He reports unfavorably on the monopoly of the Pullman Company and would like to see their cars owned by the American railroad companies themselves. As regards "sleepers" he prefers the English practice of having a separate compartment for one or two persons, with lavatory and no top berth.

As regards freight cars he would like to see one hundred or so of the Pressed Steel Car Company's cars ordered for India with a view to testing their merits. He was interested in the patent window sash balance of Mr. Edwards. As regards car lighting he still thinks the most sensible thing to be done in India is to mix acetylene with Pintsch gas.

He is strongly of opinion that the coal traffic in India, which is still in its infancy, should be dealt with in bogie cars of large carrying capacity. After seeing the plants for loading and unloading coal at the American ports he is convinced that coal can be dealt with mechanically at Calcutta at a much less cost than at present, provided large cars are used. The figures he collected as to big trainloads behind a single engine "make one's mouth water and sets one thinking why India, with its 5 ft. 6 in. gage should not go one better." He thinks that the great hauling capacity of American engines makes up for any defects in their details or for their dirty appearance. He is afraid they do not scrap weak and out-of-date engines often enough in India. The speed of goods trains he found greater in America. As regards brakes he thinks Indian railroads should gradually provide automatic brakes for all vehicles. In his opinion the advantages of increasing the capacity of goods stock cannot be overstated. If America, with the 4 ft. 8½ in. gage can haul 3,000 or 3,500 gross ton trains, there seems to him to be no good reason why the Indian 5-ft. 6-in. gage railroads with their strong roadway and bridges cannot do the same. He is convinced that if the Indian authorities only try the big engines, large capacity wagons and big trains, they will come to adapt them permanently, and when they do "India will have far and away the cheapest worked railroads in the world."

The Aspen Tunnel.

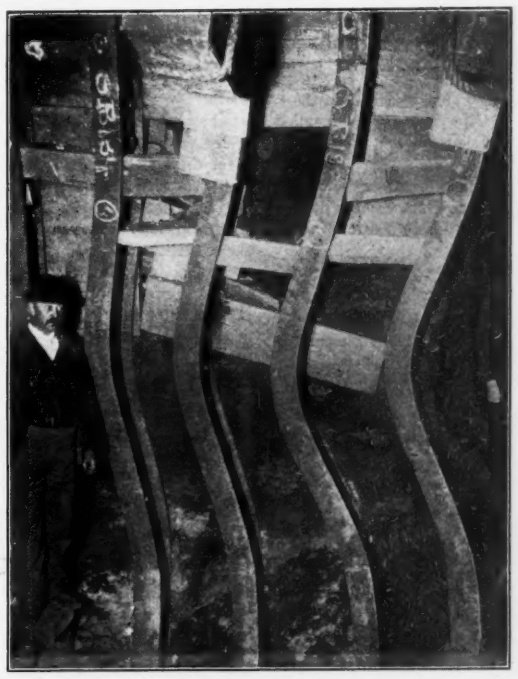
The Aspen Tunnel on the Union Pacific has been completed. This tunnel is through the Aspen Bridge, one of the eastern foothills of the Wasatch Range, and is 5,900 ft. long from portal to portal. It is a part of the improvement of the Wyoming Division on the cut-off from Leroy to Bear River.

The work has been attended with some unusual difficulties. The tunnel is driven through a carboniferous shale and the flow of this material repeatedly broke down the timbering and delayed work. Eventually steel timbering was used in the bad part, made of I-beams, 16 ft. x 6 in. x 6 in., 2 ft. apart and filled in with concrete.

The west heading was opened in March, 1899, and the east heading in April. In August of that year a shaft was sunk 300 ft., about midway. Working from the shaft, however, was stopped by the flow and pressure of water, oil, and gas; and even now pumping is to be carried on constantly to take off the water and oil. At one time it was proposed to draw off and store the oil, but that was found impracticable. Seams of good coal were pierced which will probably lead to important workings in the neighborhood. The tunnel was finally driven from the two headings. The greatest depth below the surface of the hill is 456 ft., and the highest point above sea level is 7,296 ft.

A steam shovel was used in each heading, these shovels being run on narrow gage tracks laid at grade. A second track alongside was used for material cars. This use of a steam shovel inside of a tunnel is, we suppose, novel.

The plumb timbers were of Oregon pine, 12 in. x 10 in., and on these were placed steel I-beams with concrete for the arch of the tunnel. The swelling shale was struck about 500 ft. from western portal. When this material is opened up and exposed to the air it swells with a force difficult to overcome, and in parts of the tunnel 96-lb. rails have been laid, covered with a thick bed of Portland cement concrete. An example of what this material can do in the way of bending the I-beam posts is shown in one of the engravings herewith taken from the photo-



Aspen Tunnel—Beams 16 ft. x 6 in. x 6 in. Bent by Upthrust of Ground.

graph. It sometimes happened that the shale swelled simultaneously from the bottom and the sides and entirely closed the tunnel.

Manhattan Terminal of the Brooklyn Bridge.

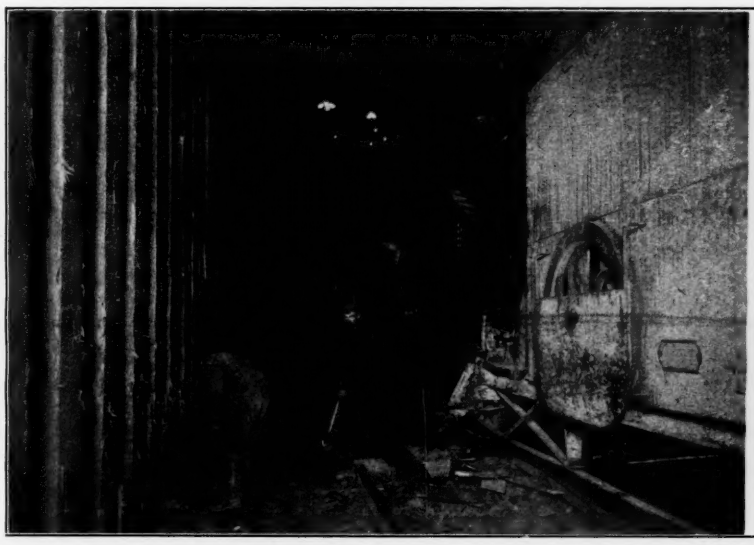
Mr. C. C. Martin, Chief Engineer and Superintendent of the New York and Brooklyn bridge, has made to the Bridge Commissioners his report upon the recommendations of the Board of Experts in regard to the improvement of the Manhattan Terminal.

Mr. Martin accepts the recommendation that the existing bridge be connected with bridges No. 2 and No. 3 by an elevated railroad north on Center street. He recommends, however, a few changes which probably are improvements. He urges that work on this connecting line be begun at once and points out that it will begin to give perceptible relief before the whole line of the connecting loop is in operation.

Mr. Martin does not approve of the proposition for an elevated railroad through Park row and Vesey street to West street. He says that this would cause a crossing of loaded trains at grade which, of course, is true, as trains coming to the bridge from Center street must cross trains leaving for Vesey street. He does not think that trains could be fed to the bridge from these two connecting lines at intervals of 45 seconds and that arrangements for tail switching on the bridge should be retained.

Mr. Martin does not approve of the proposition to remove the trolley tracks from the present roadway level and put them on the level of the gallery floor. He recommends, however, the alternative plan suggested by the Board of Experts, namely, to leave the existing trolley loops where they are and make five new loops farther east, still on the promenade level.

The suggestions of the Board for an additional stairway at Rose street and for enlarging the stairway at William street are approved.



Steam Shovel in East Bench.

Steel and Concrete Lining—First Lift of Concrete in Place.

Aspen Tunnel—Union Pacific Railway.

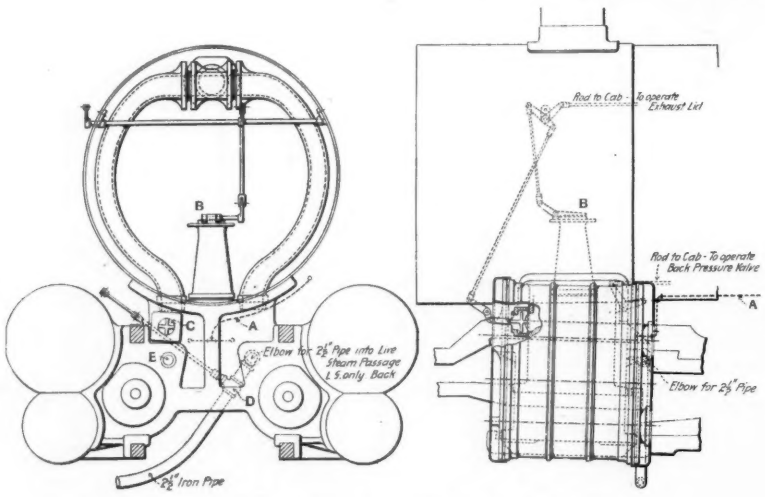
The suggestion of the Board that the trolley track and the roadway be separated from each other by curbs is not approved by Mr. Martin for the reason that it would reduce the speed of all vehicles to the speed of the slowest team and would cause blockades in case of breakdown on the bridge. He thinks that with good police supervision, interference of teams with trolley cars can be reduced so far as to get all the good results of the plan suggested by the Board.

The report recommended that the present system of operation of the bridge cars be left unchanged until the Center street line can be ready for operation as far as the Worth street station. Concerning this Mr. Martin says: "In this recommendation of the Board I concur. There is no possible temporary arrangement that has yet been suggested that will relieve the congestion at the New York Terminal and relief can be had only by the completion of the other bridges and the execution of the plans approved above."

The Baldwin Locomotive Works Back-Pressure Brake.

The accompanying illustration shows a new arrangement of automatic water brake recently brought out by the Baldwin Locomotive Works. It has been applied to a number of consolidation freight locomotives, of the No. 201 Class, for the Colorado Midland. The cylinders of those locomotives are compounded on the Vauclain principle and are somewhat different from the ordinary arrangement as they are set at an angle to the usual horizontal center line of motion, to give greater track clearance vertically at the front end of the cylinders. This arrangement of cylinders was thought necessary by the motive power department of the Colorado Midland on account of rocks or earth that sometimes offer obstruction close to the track. Aside from this setting of the cylinders the locomotives are built along regular lines.

The new back pressure brake is also used on the Santa Fe Prairie type passenger locomotives described in our issue of Nov. 22. When using this brake going down grades the driver brake should be cut out so that the



Arrangement of Baldwin Locomotive Works Back-Pressure Brake.

Westinghouse air-brake will apply only to the tender and train. The reverse lever is put in full back motion, the small Chatelier valve in the cab is opened to supply steam to the exhaust passages of the cylinders at A, and the damper B is closed over the exhaust nozzle. Air is admitted to the exhaust passages through the inlet valve C, and the steam from the Chatelier valve will keep the cylinders from overheating and will be compressed in the cylinders and steam passages, thus retarding the motion of the pistons and wheels, through the medium of the connecting rods. Anyone who knows the working of the ordinary water brake will readily understand the working of this new brake. As the reverse lever is in full back motion the pistons will soon pump up an air pressure in the steam passages and thus assist the retardation of engine and train. Care must be taken that the wheels do not lock, and if the rail is bad a little sand on the rail is a good thing.

The accumulated pressure can be relieved through the gate valve D which is operated by a lever in the cab, and the establishment of a pressure suitable for existing conditions is therefore within control of the engineer. The speed of the engine is thus regulated by opening or closing the valve D, and a safety valve is also provided in the saddle to protect the passages against excessive pressure. This safety valve should be set to relieve at boiler pressure, or a little higher, so that no steam will escape from it when the engine is working steam. It is said that a very little practice with this device demonstrates its great usefulness.

Disastrous Collision at Seneca, Mich.

In a butting collision of passenger trains on the Wabash Railroad, near Seneca, Mich., on the evening of Nov. 27, two carloads of Italian emigrants were completely crushed, 50 or more of these and other passengers were killed, many of them being burned to death, and over 100 were injured. The main cause of the collision was a mistake on the part of the eastbound engineman in reading a telegraphic order.

Seneca is on the line of the Wabash, between Detroit and Chicago. The trains in collision were No. 13, westbound, and No. 4, eastbound. The westbound train of nine cars was drawn by two engines. Two cars next to the baggage car, both carrying emigrants, were completely wrecked. In the eastbound train a passenger car, said to be near the rear of the train, was telescoped, and six or more of its occupants were killed. The collision occurred about 6.40 p. m. The eastbound train had just passed Seneca station, where it should have stopped, and both trains appear to have been running at high speed.

The meeting order, as given to the westbound train, read as follows:

> Order No. 82, trains Nos. 13 and 3.
> No. 4, engine 609, will meet No. 13, engines 88 and 151, at Seneca and No. 3, engine 623, at Sand Creek. Engines Nos. 88 and 151 will double head No. 13.

It seems that Engineman Strong, of No. 4, overlooked the words "at Seneca" in the order. His copy was lost in the wreck. He claims that his fireman, as well as the conductor and one brakeman, understood the order the same as he did, but this appears to be disproved by the fact that the brakeman tried to stop the train as soon as he saw that he was passing Seneca station. Strong and his fireman jumped off and escaped with slight injuries. Strong is 56 years old and has worked for the Wabash 30 years.

The line is straight for many miles. It appears that both trains had electric headlights and Strong says that he saw the westbound train when it was several miles away. He assumed that No. 13 was standing on the side track at Sand Creek, four miles east of Seneca. Why he did not see the light when it came nearer to him and why the westbound engineman did not see Strong's headlight are questions on which no information is given.

The conductor noticed the lights of Seneca station as he passed them, but he says that he assumed that the engineman was intending to go to the farther switch.

Engineman Strong says that on approaching the meeting point he should, according to the rule, sound one long and one short blast on the whistle, and that his omission to do this before reaching Seneca should have warned the conductor and brakeman to stop the train.

The exact number of passengers killed has not yet been ascertained. The first reports said that about 190 passengers were on the westbound train; and, by estimating the number of persons saved, it was thought that over 100 were killed. Many bodies must have been burned to ashes. Officers of the Italian government, in Chicago, after learning what they could about the number and the names of the emigrants, thought that the number killed had been exaggerated, and it seems likely that the total may be less than 50. As before stated a number of passengers in the eastbound train were killed, and at least three trainmen. It is said that the emigrant cars were lighted by oil lamps, but whether or not the fire was caused or was aggravated by the presence of the oil is not stated. The fire raged for five hours.

Collision of Fast Trains at Franconia, Arizona.

On the morning of Nov. 20, about 5 o'clock, the westbound "California Limited" train of the Atchison, Topeka & Santa Fe, No. 3, and the eastbound train of the same class, No. 4, collided at high speed two miles west of Franconia, Ariz., and the front portions of both trains were completely wrecked. Train No. 4 was drawn by two engines, one of which exploded, and one or both had in their tenders tanks of fuel oil. The wreck took fire instantly and two combination cars, two dining cars and one sleeping car were completely destroyed. One engineman, two firemen, two dining car waiters and the barber were killed and 12 other employees were injured. The bodies of the dead were almost destroyed by fire. It is said that only three passengers were injured, both trains being made up of very strong cars, fully vestibuled. It is said that the westbound train had received an order not to pass Franconia before 5 o'clock and that this order was not heeded. Both trains had electric headlights, but it is said that a curve in the line, with low sand hills at one side, obscured the view.

A New London Tube Railroad.

Another addition was made on Sunday, Nov. 17, to London's system of deep-level tube railroads. This was the extension of the City & South London Railway (the pioneer of these lines) from Moorgate street to The Angel at Islington. It is only 1½ miles in length, and paralleled with horse tramways the whole way, but is quite certain to secure a very large traffic as part of the only direct line of the kind between the northern and southern suburbs of London.

The work consists of the usual cast-iron segment construction, at a depth at the terminus of about 100 ft. There are, of course, two separate tunnels all the way, enlarging at the intermediate stations, but at The Angel one tunnel of 30-ft. diam. contains both lines of rail and an island platform.

Several trains of new coaches have been built by the Bristol Wagon & Carriage Company, and are practically reduced copies of the Central London Company's stock, having a shallow clerestory in the roof and large windows along the sides. There are no transverse seats, however, as on that line, where each coach has four on each side in the center seating 16. Here there are no divisions or arms between the places, but half-compartment, with a doorway but no door, makes an apparently useless semi-division in each vehicle. There are four electric lamps on each side of the clerestory, and 22 in that, so that there is abundance of light. The seats are upholstered in rep, though for lines of this kind perforated wood is a cleaner and more sanitary material.

On the extension are two intermediate stations, Old Street, half a mile from Moorgate street; and City Road, about three furlongs further. At Old street there will be a communication by which passengers can pass to or from the Great Northern & City Railway, a tube line to take main-line rolling stock, now under construction. The line ends at the corner of Torrens street and City Road, a few yards from the great center of road and tramway traffic known as The Angel, at Islington.

The tunnels on the extension have not yet been filled up flush with any lining material between the flanges of the segments, but this can be done by degrees. The lifts are by Easton & Co., of London and Erith, electric, on Bjornstad's system. Some have gas in them, as well as electric lamps. Both kinds of illumination are also, to a certain extent, applied in the passages between the platforms and lifts. Every station has a circular staircase in addition to the lifts, a highly necessary provision, and one useful for ventilation. As regards the latter subject, something will have to be done sooner or later to improve it. It is the weak point of these deep tube lines. The absurdly overdone outcry against the sulphur fumes of the steam underground lines has resulted, so far, in treating people to a sickly, warm, semi-putrid smell on the electric railroads. Perhaps, the odor of decaying fruit is the least unpleasant thing to compare it to. Doubtless, it is connected with the electrical discharges, and it seems likely the lifts interfere with the free passage of currents of air up and down the large shafts, although the lifts do not fit the shafts at all closely.

The uniform fare system of the Central London is not adopted on the City & South London. The fare through from The Angel to the southern terminus at Clapham Common is sixpence, for 6¼ miles, but return tickets at a reduction are issued, available only the day of issue, and the intermediate fares are extremely low; only one penny, for instance, from The Angel to Moorgate street. Though there is only one class, tickets of at least three different colors are used. The old coaches, which were of a remarkably depressing and dismal kind, are being altered and made more cheerful. All the trains are now made up to four coaches, only three having been formerly used. Some new engines, built last year and this by Crompton & Co., of Chelmsford, are running. They are rather like the old ones of Mather & Platt's, and quite different in appearance from those of the Central London.

All the trains run through between the termini in 27 minutes, there being no branches or physical connections anywhere. They run from The Angel every four minutes from 5:55 a.m. till 11:15 p.m., and from Clapham Common from 5:55 till 10:51. On Sunday the service does not begin from either end till 11:50 a.m. and ceases about one-quarter of an hour earlier than on week days.

Additional generating plant has been laid down at Stockwell Station, and there is a substation at The Angel, and another at London Bridge on the old part of the line, where the current of 1,000 volts is reduced to 500 for use in the motors. A storage battery of 250 cells, for lighting the stations and working the lifts, if the engines fail, is placed below the platform at The Angel terminus. As a 2½-minute, or even a 2-minute service is intended when there is sufficient rolling stock, a good margin of power has been allowed for at Stockwell. There are now 52 engines and 124 coaches, equal to 31 trains, on the line. Each train bears a number. About 8,000 persons traveled on the extension on the opening day, but the fact of the opening was not widely known. Mr. P. C. McMahon is the company's engineer, under whom the new work has been carried out. P.

London, S. W., Nov. 20, 1901.

On the morning of Nov. 26 a boiler in the shop of the Penberthy Injector Company, at Brooklyn avenue, Detroit, Mich., exploded, causing great destruction and killing at least 26 men, and 24 other persons were injured. The building containing the boiler, a brick structure three stories high, 54 x 100 ft., was completely destroyed.

The Train Staff on the Reading.

The Philadelphia & Reading has lately introduced the Union Switch & Signal Company's electric train staff, on a short section of single track, using the new-style instruments, in which the staff is only 6 in. long. We show herewith a sketch of the single track section and the approaches to it; and from Superintendent A. T. Dice we have the following particulars of the installation and of the regulations for moving trains.

The section equipped is that between Mahanoy Tunnel and Buck Mountain, a distance of 3,888 ft., single track. Between these stations is Mahanoy Tunnel, 3,404 ft. long. At the north, or Buck Mountain end, is the beginning of double track, which extends north through the Mahanoy, Locust Summit and Shamokin anthracite coal regions, 43 miles. There are also yards at Buck Mountain, into which coal is switched for movement south through the tunnel both to Tamaqua, and over the Tamanend Branch. In switching the coal into this yard, as well as out of it, engines have to run into the north end of the tunnel.

At Mahanoy Tunnel, or south end, there is a passing siding and the junction with the Tamanend Branch. The switches of both are within the block, or north of Mahanoy Tunnel office.

There is a rising grade from the south of 1.62 ft. per 100 ft. to south portal of tunnel, thence in tunnel, 1.12 per cent. for about 800 ft.; thence .66 per cent. for 1,500 ft., and thence .36 per cent. to summit at north portal. The northbound freight trains have one and two assisting engines to each train, which are required to assist all the way through the tunnel, the heaviest engines hauling only 650 tons up this grade. All movements into or through the tunnel are now made on authority of the staff. The order placing it in service reads as follows:

"Beginning at 12:01 p.m., Thursday, Oct. 10, the movement of trains between Buck Mountain and Mahanoy Tunnel will be controlled absolutely by the train staff system, and semaphore block signals. The staff, which is of metal, ¾ in. in diam. and 6 in. long, will be delivered in a rubber case, and it must be known, when received, that the staff is in the case.

"Trains must not enter this block unless the clear signal is displayed, and the staff is received from the signalman, and is in possession of the conductor or engineman. When more than one engine is attached to a train, the staff must be delivered to the last engine, but the enginemen of the other engines must know that the staff is ready for delivery to the last engine before entering the block. The staff must be delivered to the signalman, as the train passes out of the block, and must then be passed through the staff machine and never transferred from one train to another. Engines switching at either end of the block will retain the staff until the switching movement is completed, when it must be delivered to the signalman, after the block is clear.

"In case of failure of the block signal or electrical appliances, the movement of trains will be directed by telegraphic train orders, which must be delivered to the signalman as the train passes out of the block."

Under normal conditions of traffic, there are about 65 movements through this tunnel each 24 hours, without counting the northward movements of the assisting engines. On the southward movement, two engines are usually coupled together and moved through the tunnel on one staff, to avoid the accumulation of staffs in the machine at the south end.

Passenger trains require about three minutes, and freight trains about eight minutes, in running between Mahanoy Tunnel and Buck Mountain; while the switching movements (most of which are at the north end) require about 15 minutes each. This is the time counted from the time of removal of staff until it is again replaced in the machine.

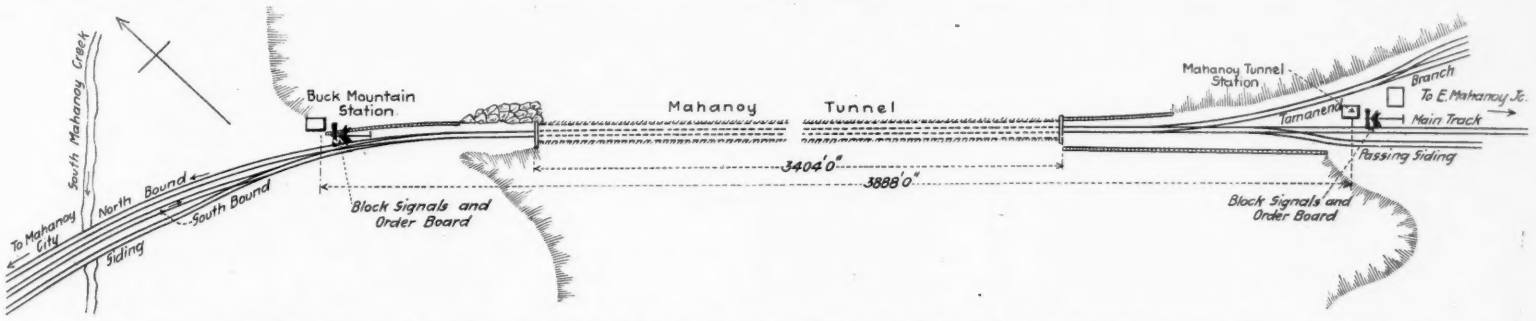
While making switching movements within the limits of the staff block, enginemen are required to have a staff in their possession. The staff must be returned to the office from which it was received, after the switching is completed.

The junction of the Tamanend Branch, as well as the north end of the passing siding, being north of Mahanoy Tunnel station, or within the block, it was thought inadvisable to clear the semaphore signal for trains entering the block from these points, and, accordingly, a special form of clearance card is provided, which is used "only for trains entering the block from tracks other than main tracks." It is delivered, with the staff, to the signalman as the train passes out of the block.

There are two staff instruments, one each at Buck Mountain and Mahanoy Tunnel. There are 15 staffs in use in each machine, or a total of 30. The bell signals prescribed for used in connection with the staff system are those adopted by the American Railway Association for the "controlled manual block system," with the addition of one signal for switching movements. After giving the prescribed signals and getting a release of a staff, it is necessary to remove the staff from the instrument, and with it unlock the lever controlling the semaphore signal, before it is possible to give a clear signal. As there is another line besides this one, between East Mahanoy Junction and West Milton, the traffic varies from time to time; at one time there will be an accumulation of staffs at Buck Mountain and again at Mahanoy Tunnel. The excess staffs are then transferred to the opposite station by the signal repairman; the signalman not being able to remove staffs except in the orderly operation of the system.

Staffs are delivered and received direct from engineman to signalman and vice versa, while trains are running about eight miles an hour, and as trains are not allowed to exceed 12 miles an hour through the tunnel, this reduction in speed is not seriously felt. Experiments are, however, being made with devices for delivering and receiving the staffs at a higher rate of speed.

Before the introduction of the staff system the telegraph block system was used between these points, which provided for the handling of scheduled trains and extra trains not interfering with scheduled trains, or with each other. All other trains were forwarded on telegraphic train orders issued by the train despatcher. Now, all train orders are eliminated (except in case of failure of staff machine or block signals); and trains are governed absolutely by the staff and block signals. This has reduced the work of the train despatchers, has eliminated the danger of error in orders, and very greatly facilitated the movement of trains. It is estimated that the capacity of the single track line through the tunnel has been increased 30 per cent.



Single-Track Line of the Philadelphia & Reading Through Mahanoy Tunnel; Worked by the Union Switch & Signal Company's Electric Train-Staff.

Meeting of the American Society of Mechanical Engineers.

The Forty-fourth Annual Meeting of the American Society of Mechanical Engineers began at the house of the Society, at 12 West 31st street, New York, on Tuesday evening, Dec. 3, with 391 members and guests present. At the opening session the annual address was made by the President, Mr. Samuel T. Wellman, who chose as his subject the

Early History of Open-Hearth Steel Manufacture in the United States.

The first suggestion of the principle upon which open-hearth steel making is based—that is, the idea of melting cast and wrought iron together to form a steel—was in France in 1722, and various attempts had been made early in the eighteenth and nineteenth centuries to accomplish it. The results were, however, unsatisfactory owing to the intense heat that soon ruined the lining of the furnaces and rendered the process commercially unprofitable.

The first regenerative furnace was built by Siemens in 1861. It was worked on a small scale, and was little more than a heating furnace. This led to the construction of the Siemens-Martin furnace, which promised so well that it attracted the attention of Mr. Hewitt, of Cooper, Hewitt & Co., who made arrangements for the erection of a 5-ton furnace in 1868. One of the greatest difficulties was teaching the melters to maintain a proper temperature. The limits at that time were narrower than they are now, as silica bricks were unknown and a lining made of clay bricks had to be used. Then the metal was likely to chill and clog the furnace, or break away the shoe and flood the ladle and carrying cars. The furnace was run at intervals, but as it was never a commercial success it was finally abandoned.

The second open-hearth furnace in this country was built by the Bay State Iron Works at South Boston, Mass., by whom it was made a commercial success. Work upon the plans for this was begun in 1868 and the furnace itself, which was of five tons capacity, was finished in 1870. As no ferromanganese could be bought at that time, the whole supply was made in crucibles on the premises. With this furnace they succeeded in making a steel containing 1.15 carbon that was perfectly malleable at all temperatures, a condition that was not attained in the Trenton furnace. The tapping was done over a fore-hearth and the ladle was carried on a turntable.

At that time the Bay State Co. was engaged in the manufacture of iron rails and one of the first uses to which the new product was put was that of forming the head of a rail welded to an iron base. The steel was rolled into slabs and one was put on top of the pile to form the head. This made a good rail, but it soon had to yield to the all-steel one. The next move was to use the product for rolling into soft steel plates. These were of a high quality and as they were cheaper than iron, a large trade was soon developed and that one furnace was run night and day for several years.

The third firm to enter upon open-hearth steel making was the Nassua Iron Co., of Nassua, N. H., who put up a 5-ton furnace, starting the work in 1871 and finishing it in 1872. Some changes were made from the South Boston furnace and English hematite pig was used for the bath. Ferromanganese was still made in the crucible. This furnace was tapped directly into the ladle without the use of the fore-hearth.

The plant of the Otis Steel Co. soon followed and this was the first one erected in the United States for the exclusive manufacture of open-hearth steel. Work was started in 1873 and finished in 1874. There were two 7-ton furnaces, with regenerative furnaces for preheating the blooms. The steel was tapped directly into the ladle, which was carried on a jib crane without the capability of being raised or lowered. This was something of an inconvenience, on account of the necessity of having all of the molds on the same level, but the advantages of safety outweighed these considerations. The charging floor was also raised to the level of the top, with hydraulic elevators for handling the material, an arrangement that made the furnaces very accessible for repairs.

The plant was not started without a great deal of trouble and some accidents. The first accident was a terrific gas explosion. These were due to the fact that all of the skilled workmen had to be educated on the premises, as there were no other works from which to draw. In 1878 two 15-ton furnaces were added and these contained a number of radical improvements, improvements that continued to be made up to 1887. The Otis plant was, at one time, the largest in the country and its plate was the standard of excellence for boiler and fire-box purposes. The blooms used were from the Champlain district, of charcoal iron, of which from 12,000 to 15,000 tons were used annually. They cost from $50 to $60 per ton, a price that may seem excessive for raw material, but when it is considered that plates were then worth $135 per ton there was a fair margin of profit.

In 1886 a furnace was converted to the basic process for the first time. The output was of a high grade and was sent out among the customers of the firm without eliciting any complaint, the fact that it was a basic product being kept a profound secret. The process was, however, so much slower than the acid and the works were so crowded that, under pressure from the selling department, the furnace was changed back to the acid process.

Later basic furnaces were erected by the Pennsylvania Steel Co. and Carnegie, and the work has grown until now three-quarters of all the open-hearth steel made in the United States is made by that process. Basic steel is the best and it is simple in both theory and practice. It is crowding out the Bessemer process and will soon exceed it in tonnage, even if it does not for many years fulfill Holley's prediction of attending its rival's funeral.

Many other plants then followed in the erection of basic furnaces. The Carnegie works have 48 of 50-ton capacity each that produce 1,300,000 tons per annum. But these do not touch the limit of modern furnace capacity, as there are a number of 100-tons capacity being built and plans are in course of preparation for one of 200 tons. These large furnaces are, however, converters rather than true furnaces, as they are intended to receive their metal in a molten condition. They stand, nevertheless, as examples of the growth of the past 30 years in which open-hearth furnace capacity has increased forty-fold.

There is a movement in Austria to have the State absorb some of the principal private railroads, which is easy to understand because the rates are generally lower on the State Railroads; but at a convention of economists in Vienna recently it was pointed out that these low rates to shippers and travelers are at the expense of the country at large; for the State Railroads do not yield enough to pay interest on their cost, and the rate of profit does not increase, but decreases. It was 2.8 per cent. in 1890 and is estimated at 1.8 per cent. for the current year. The General Manager of the most prosperous of the Austrian private railroads said that passenger fares have been reduced so in Austria that this traffic yields no profit, and an increase in travel causes a decrease in net earnings.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The programme of expenditure of the Pennsylvania Railroad would seem tremendous, had we not become accustomed within the last two years to enormous figures. For instance, in addition to the 14,000 freight cars to be let by that road, which we have already mentioned, an additional lot of 4,000 has been ordered. These are all 100,000 pounds' capacity cars. Further, the locomotive programme, so far as made, covers about 300 engines for the lines East and 100 for the lines West. It is easy to figure out considerably over $20,000,000 as the expenditure for these items of equipment, to say nothing of the money to be spent on permanent way.

The ticket scalpers of New York State are rejoicing over the decision of the Court of Appeals that the law passed by the last Legislature prohibiting ticket scalping is unconstitutional. It is known as the Everett anti-scalping law and was bitterly fought from the time of the introduction of the measure, but railroad influence put it through. . . . It is not probable that this decision will end the fight against the scalpers, but it will doubtless lead to the framing of less sweeping legislation against them or to a satisfactory compromise between them and the transportation companies.—*Syracuse Herald.*

Not less sweeping, but more accurately fitted to the case, we should say. It is impossible to see how anything in the nature of a compromise between the railroads and the brokers is possible or desirable. The reason for a law is that so many brokers are swindlers. The public interest requires that the few brokers who are honest shall sacrifice their business for the benefit of the people at large, because there seems to be no practicable method of stopping the cheating without stopping the business entirely. There can be no compromise with forgers and liars. If it is impossible to frame a law that will stop fraud and at the same time pass muster with the Court of Appeals, the only remedy will be for the railroads to make "flat" one-way rates for all classes of business, so that nobody will have an inducement to speculate in tickets. Happily the railroads are coming to maintain more rational relations with one another, and it is quite possible that the strong lines will find a way, one of these days, to present a united front to the scalpers. "Government by injunction" has been successful in a number of cases during the past year, the railroads centering in a convention city joining in an application for an injunction to forbid dealing in certain round-trip tickets. This is good, as far as it goes; but it will be matter for regret if there is nothing better than this for a permanent protection against the maintenance of irresponsible ticket offices.

With new advantages we must often accept new drawbacks. The use of green lights for the go-ahead signal in semaphores at night is now very generally recognized as an advantage; every one who becomes familiar with the new practice feels a marked satisfaction at getting rid of the white-light go-ahead indication, provided the green lights are large and are well cared for. But, of course, the runner must take care not to be misled by any stray green-light which is not intended for him, as, before, he had to look out for stray white lights. This is a disadvantage; not nearly so serious a disadvantage as was the former one, for green lights are nowhere near as numerous as white lights; but still it is an element in the question of successful signaling. This point is brought to mind by a newspaper report, from Quincy, Ohio, of a train accident which is said to be due to the fact that the engineman of an important passenger train mistook a green light on a caboose for the green light of a fixed signal. He was approaching the crossing of another railroad, and the caboose light apparently shone in his direction from the side of a caboose on the transverse road; and it seems that the derailer tipped his big new engine into the ditch. We are not recording the circumstances as an excuse for the engineman, for it may be that the story is colored by the reporter's fancy and, in any event, the height of the semaphore and the situation of the distant signal would have to be known before one could judge whether the engineman was at all excusable. But the case is a concrete reminder—the question has already been presented theoretically—that green lights on cabooses and locomotives are used in a way that is inconsistent with the new use of the same color in semaphores. The caboose and engine lights ought to be changed. After all the academic discussion that has been indulged in about the impropriety of using red lights in distant signals—a practice which is perfectly safe in England—and the trouble we have taken to introduce yellow lights and other devices to avoid a theoretical inconsistency, no American can with a good face refuse to continue the quest for consistency. The problem is not a very difficult one, as will appear from a consideration of the changes which have been made in tail lights on roads which have four main tracks, and from the practice of the Michigan Central, where trains are run without "classification" signals on the engines. But in this field even an easy problem requires a good deal of time for its development and settlement, so that it will be well if this one be taken up without delay.

The lesson that with new improvements we are pretty likely to encounter some new difficulty is also enforced by another accident which has recently been reported, the butting collision of two heavy and luxurious "California Limited" express trains at Franconia, Arizona, Nov. 20, where seven men were killed. This collision was a terrible one, simply as a collision; but fire broke out in the wreck and two dining cars, two composite cars and one sleeping car were burnt up. The fire is said to have been greatly intensified—and this is the new feature to which we allude—by the oil in the tender of one of the three locomotives, which was an oil burner. The bodies of two firemen and one dining-car waiter were burnt up. The way to prevent losses of life and property by the burning of oil in tenders is, of course, to prevent collisions; and we may expect that so notable a disaster as this will be followed by effective measures in this direction; but somehow, from one cause or another, distressing collisions continue. In this case the passengers escaped harm, almost entirely, thanks to the vestibules and the strong construction of the car-frames. This marks the great improvement which has taken place in car-building during the past few years, and is cause for congratulation. Nevertheless, a collision like this helps to swell—and to call to public attention in a very disagreeable way—a record of collisions which, in spite of all the progress of the past dozen years, continues to cause very frequent blots on the current history of American railroad management.

There was a time when it was generally recognized that railroading was not so safe in the far West as in the older States, for the reason that experienced, intelligent and careful men were much harder to find in the mountains and the deserts. To what extent the same condition exists now we do not know, though we do know that there has been great improvement on the principal roads. But the former condition is recalled by recent communications from Arizona and Utah, one a press despatch spoken of in the paragraph preceding this, and the other a letter on our first page. Concerning the precise cause of the collision in Arizona no authentic details are yet at hand, and so there is nothing to say concerning it; but nobody will deny that the Utah correspondent describes what is the true cause of many collisions which occur every year. We commend his letter to every superintendent and trainmaster. This may be a very irregular way of instructing superintendents and trainmasters in their duties, but conversations which we have had with some of them now and then indicate that advice of the kind here given will not be out of place, even if it does come from below instead of above. We cannot even touch upon the subject of meeting-orders, without first recording our standing protest against depending on anything short of the absolute block system as the regular and usual method of successfully running trains on single (or double) track without smashing them together; but, if the block system is not to be used, forgetfulness and overconfidence on the part of enginemen constitute a disease or mental infirmity which must be constantly combatted. The Utah letter is not printed for the exclusive use of Utah readers. The writer of these lines saw a fireman the other day, on a fast train, of one of the best roads, who did not know what time his train was due at the end of his run—the terminus of the division—and he was not a spare man, either. How intelligent an interest would such a man take in train orders? We do not mention this bit of ignorance as a fatal fault; still it indicates that the trainmaster had not been over zealous in brightening the minds of his firemen. Giving a separate copy of an order to the fireman would do good in many cases, for it is readily imaginable that even so little a thing as hesitating to ask for a second look at an order may result in a misunderstanding. But merely providing the additional copy would not, of course, be enough, in itself to insure better attention. Training would also be necessary. So simple a rule as that requiring the engineman and fireman to "holler" to each other on sighting each fixed signal is not carried out with regularity unless the men are followed up.

The Seneca Collision.

After writing the foregoing paragraphs about overlooking train orders, we were called upon to chronicle a disaster much greater than that which is there spoken of, and the particulars, so far as they have been gathered, appear in another column. No one at this distance can with the present information make a just apportionment of the blame for the Seneca collision any more than for that at Franconia; but the main responsibility is pretty clear; and what may be called collateral questions concerning the cause are so numerous and of such importance that it will be worth while to note these questions in order, preparatory to intelligent discussion of the case when the facts are fully known.

From the point of view of the American railroad officer, brought up under the "despatching system," the preventive of butting collisions is, first, (without changes of rules), the establishment of perfect discipline (which implies high class men of adequate experience), or, second, the more costly block system. This is the alternative. Discipline is nowhere perfect. Not one collision in a hundred is wholly due to that cause which is often spoken of as of such great importance, unaccountable forgetfulness of competent men. In ninety-nine cases out of a hundred we find neglect of plain rules, either by the trainmen or the station men, or by the officer who made the rules, which is of such a character that it indicates that there has been habitual neglect; so that we are forced to conclude that better discipline would have been a preventive.

But whatever we may say about discipline, lines which do not use the block system continue to pile up the collision record. The block system has been adopted on many hundred miles of single-track lines and has been shown to be the true and simple remedy. It is not perfection, but it introduces such radically different safeguards that it is not to be compared with the old method. Improvement in discipline is useful and praiseworthy everywhere; but the block system makes such an improvement in methods that improved results are accomplished even without improving the quality of the men. The only reason for not using it is that it is costly. A road can save money by doing without it, provided the men do not make mistakes which cause wrecks that deplete the treasury faster than the maintenance of the safeguards would.

This much we have said, so that the reader shall not forget that the only rational method of running fast trains is by the block system. As, however, many managers still seem to feel satisfied to continue to depend on the old safeguards, let us inquire what specific weaknesses these safeguards developed in the case under consideration.

1. Two meeting points were made in a single sentence. If they had been in separate paragraphs the oversight might not have occurred. The standard code originally recommended (but now does not) that for two movements (that is, to make two meeting points) two separate orders should be issued. Probably this recommendation has been dropped because no despatcher will act on it; it would increase delays to trains. But certainly any country school teacher would know enough to say that to make two separate paragraphs would be a marked improvement. Why should not the order to No. 4 be headed, "Two meeting points?" Why not name No. 4 twice in the body of the message? It would be more emphatic to say:

No. 4 and No. 13 will meet at Seneca.
No. 4 and No. 3 will meet at Sand Creek.

2. Was there any fault in the penmanship? This collision would be a means of much good if it should call adequate attention to the fact that many despatchers send orders too fast, and that hundreds of operators copy in a slovenly hand. Only constant watchfulness on the part of the officer who supervises the operators can prevent these irregularities.

3. The conductor and the brakeman on the one hand, and the engineman and fireman on the other appear to have gone through some sort of process of reading aloud to each other. The failure at this point demands the fullest inquiry. The fireman's reading is no safeguard, unless it is intelligent enough to be depended upon as the principal reading.

4. Why was not the meeting order sent to the operator at Seneca? If there is no telegraph office there, the newspapers and perhaps the State Railroad Commissioner will demand that one be established. This seems absurd from the railroad's standpoint; but when a hundred persons are killed in a single collision it is not to be wondered at that public opinion demands either better telegraph facilities or double track, or else the abandonment of the attempt to run fast trains.

5. On the Cincinnati, New Orleans & Texas Pacific, the Chicago & Alton, and, we believe, the Baltimore & Ohio and some other roads, the conductor of a passenger train must give to the engineman a special signal on approaching a meeting point, and the engineman must answer it. Why is not this signal in use everywhere? Have the roads which have not adopted it a good defense? We have heard no argument against it. It appears that on the Wabash the engineman is expected to give a steam whistle signal on approaching a meeting point, and that the conductor must listen for this, being prepared to stop the train if it is not heard. Engineman Strong blames the conductor for not checking him in this instance; so here is a question whether a good rule was disobeyed, whether it had been habitually neglected or whether it is not a good rule. There is one advantage in having the conductor take the initiative, for his signal is sure to be heard by the engineman, while the conductor might fail, or claim that he failed, to hear the whistle of the locomotive. Moreover, the engineman can determine just what moment to check forgetfulness in the conductor, better than the conductor can decide when to check the engineman.

The action of the conductor, and especially of the brakeman, in this case (neither of them having entirely ignored the rule) again shows what has been repeatedly shown before, that the usual rule requiring men in the cars of a train to check forgetfulness on the part of enginemen when approaching meeting points is not a reliable safeguard. Time and again conductors have observed an engineman's forgetfulness, but have failed to stop the train soon enough to prevent a collision. This is a case where a very few seconds' loss of time may be fatal. It is true that even when the conductor is required to first signal to the engineman, one may forget to give the signal and the other may at the same time neglect to watch for it; but surely it is easier for the engineman to remember meeting points than for a passenger conductor, for his other duties do not distract him so much; and if he does forget, he is more likely to be reminded of his lapse by what can be seen ahead on approaching the meeting point.

And finally it is to be borne in mind that here, as in any other matter requiring constant performance of such a duty as merely listening for a signal, the only satisfactory way of assuring constant vigilance is to maintain frequent tests.

6. And this leads to the observation that no intelligent verdict can be formed on any feature of the case without a full knowledge of the training and records of all these men in their past service.

7. The train having got by the meeting point, the question arises, Why did not the electric headlights prevent the collision? Was there a hill or a hollow which interrupted the view of either train from the other? If Engineman Strong thought that No. 13 was on the side track at Sand Creek, how about the enforcement of the rule requiring headlights to be covered when standing on a side track? Can it be that the engineman is correct in saying that it is impossible to tell whether a train is 100 rods or five miles away? Such a disastrous butting collision, on a straight and level track, with no fog or snow in the air, is one of the most astonishing things that ever occurred on an American railroad.

8. The collision having occurred, why were the emigrant cars so completely crushed? Is this case like one which occurred in the same State in 1893, where light cars in the front of the train were crushed by the weight of heavy and strong cars behind them?

The Superintendent of the R., W. & O. Division of the New York Central has issued to enginemen a notice emphasizing the rule which forbids unnecessary whistling in cities and villages; but, according to the newspaper accounts, the notice says that at country road crossings the blasts of the whistle should be long and loud. "Long and loud" allows to the engineman a good deal of room for using his own judgment, and an engineman's judgment is likely to be quite different from that of the poets, invalids and nurses who have to endure the whistling, some of whom live near country crossings. The New York law does not absolutely require the whistle signal; it says whistle *or* bell. A blast of the whistle lasting four seconds is really ample for all occasions; but it is safe to assume that four out of five enginemen will interpret an order of this kind as meaning twice that length of time, if not a good deal more. Most whistles would give a warning adequate for all ordinary occasions if opened only half way. We are not saying that a rule prescribing half-opening should be adopted, for much care would be required to enforce it; and, further, we are not unmindful of the perils—legal and physical—of country crossings; but it is regrettable to see noise encouraged by an official order. It is to be remembered, also, that passengers on trains are often annoyed by excessive whistling. A correspondent of the *Railroad Gazette* recently advocated a shield to throw all of the noise of the locomotive whistle forward, with a view to relieving the passengers. With a crossing every two miles, and a runner who whistles six or eight seconds at every crossing, a passenger sitting in the first or second car from the engine will have very little difficulty in keeping awake, however weary he may be, especially in summer. And if he wishes to sleep, he is likely to get mad.

The last Paris World's Fair brought, it is true, a vast traffic to the French railroads, but apparently no profit. The *Economiste Français* has been studying the subject and finds that while the French railroads carried 440 millions of passengers in 1900, against 399 millions the year before, and earned gross 94 million francs more, their expenses increased 93 million francs. Extensive and costly preparations had been made for the exhibition traffic, and the speed of trains on most of the lines was greatly increased, and this, together with the general rise in prices of material, in 1899 and 1900, accounts for the increase in expenses. This has not been so in previous world's fair years. In 1867 the railroads carried 14 million (17 per cent.) more passengers than in 1866, earned 60 millions more gross and 25 millions more net. In 1878 the increase in passengers was also 14 millions (10 per cent.), the increase in earnings 70 millions gross and 40 millions net. In 1889, with an increase of 20½ millions (9 per cent.) in passengers, gross earnings increased 78 and net 48 millions. Three of the great French railroad companies in 1900 had their net earnings reduced by the exhibition traffic. The amount of this traffic, however, was unprecedented. The arrivals and departures at the Paris stations during the exposition were 92,100,000 in 1900 (seven months) and 14,505,000 more than the year before. In 1889 (six months) they were 57,500,000, and 19,000,000 more than in 1888; in 1878, 44,800,000, and 5,900,000 more than in 1877. Thus the travel last year was more than double that in 1878; but the railroads seem to have gained little but glory from their great performance.

An official report of the traffic on the Siberian Railroad has been published, by which it appears that the freight shipments on it were 772,813 tons in 1900, against 716,237 in 1899. The principal freight was grain, of which 316,350 tons were shipped. Of the total grain shipped 12 per cent. went to Baltic ports, 8 per cent. to Archangel, 18½ to European Russia, 20½ to the Ural district (the country bordering European Russia, where mines abound), and 38¾ per cent. went to places in Siberia itself. This grain was shipped chiefly from stations on the western 325 miles of the road. Wheat formed 56 per cent. of the grain shipments, and more than nine-tenths of this came from the 325 miles named—about as far across as Iowa. Live stock shipments were insignificant—5,647 horses, 9,705 cattle; but 31,518 tons of butter, and 44,856 tons of meat were carried. The shipments of tea were 28,692 tons. The coal shipments were only 22,302 tons. As the enumerated articles altogether make but 470,000 tons, we may assume that the largest part of the other 300,000 consisted of materials for the extension of the railroad.

NEW PUBLICATIONS.

Smoley's Tables, containing parallel tables of logarithms and squares of feet, inches and fractions of inches, expressed in decimals of a foot and advancing by one thirty-seconds of an inch from zero to fifty feet. By Constantine Smoley, C. E. New York: The Engineering News Publishing Co. 1901. $3.

The scheme of Mr. Smoley's tables cannot be better described than by reprinting a fragment from one page as below:

40′

Fractions of an Inch.	9″		10″		
	Log.	Square.	Log.	Square.	Log
0	1.61013	1660.5625	1.61101	1667 3611	1674.
1/32	1.61016	1660.7747	1.61104	1667.5738	167
1/16	1.61018	1660.9870	1.61107	1667.7865	1674
3/32	1.61021	1661.1993	1.61110	1667.9992	16
1/8	1.61024	1661.4116	1.61113	1668.2119	

Each page contains 3 inches as in the example; the quantities on this page are for 40 ft. and for 9, 10 and 11 in., advancing by each thirty-second of an inch. These tables are practically the whole book and cover 200 pages. There is, however, a table of four-place logarithms of numbers up to 1,000, and there are a few important constants with their logarithms. A few pages are devoted to explanations and examples of the use of the tables. We judge that every computer and draughtsman in such establishments as bridge offices and the offices of architects designing steel structures will find this collection the most useful one that he has ever seen. It appears from the author's explanation of the method of computation and compilation that the tables are likely to be accurate which, of course, is a vital point. In an advertising circular sent out are letters from five engineers and chief draughtsmen, all of whom speak highly of the tables from actual experience, and one of whom orders 14 copies and another six copies, which is the best evidence that could be given of the utility of the work.

The Practical Engineer Pocketbook, for 1902. Leather, gilt. 536 pages.

The Practical Engineer Electrical Pocketbook, for 1902. Leather, gilt. 304 pages. Manchester, England: Technical Publishing Co., Ltd. New York: D. Van Nostrand Co.

The "Practical Engineer Pocketbook" now appears in its fourteenth edition and in this issue many additional tables are given, and especial attention has been directed to those in the section on gas engines. Other new features deal with mechanical refrigeration, with the copying of drawings, and with motor vehicles.

The "Electrical Pocketbook" is in its third edition and here also several additions have been made, new tables have been included; and the increasing importance of dust destructors in connection with electrical power undertakings has suggested a new section devoted to this branch of electrical engineering.

Both of these pocketbooks have been received from year to year with a good deal of favor and justly so; and they have the considerable recommendation of being cheap. Each of them is sold at 1s., or at 1s. 6d., with leaves for a diary.

Iron and Steel Statistics.—The Annual Statistical Report of the American Iron and Steel Association, as presented to the Members on Nov. 25, has just been made public and is ready for distribution. This may be had from the General Manager of the Association, Mr. James M. Swank, at 261 South Fourth street, Philadelphia, Pa. It is a pamphlet of 72 pages, the price of which is $3, or 12s. 6d. As our readers undoubtedly know, this annual report contains statistics of the iron and steel industries of the United States for the year reported on, and for preceding years; also statistics of the ore, coal, coke, and shipbuilding industries; of imports and exports of iron and steel, and (in this special case) a supplementary paper reviewing the world's iron and steel industries at the end of the nineteenth century. In a later issue we shall give some of the facts collected by Mr. Swank.

TRADE CATALOGUES.

The Railway Materials Co., Old Colony Building, Chicago, has issued a catalogue of oil furnaces containing 10 engravings of different types of Ferguson furnaces. These include flue welding furnaces, rivet furnaces, bolt furnaces, forging furnaces, tempering furnaces, spring furnaces and furnaces for annealing large plates in boiler shops. The Ferguson portable heater and kindler is also shown as used to kindle fires in locomotives and to heat bent parts when repairing metal cars. All these devices are now in quite general use. Opposite each engraving is a statement of the capacity and rate of working of that furnace and the pamphlet also contains a short discussion of the use of oil fuel in shops.

It is pointed out that this use of oil has been retarded on account of the idea, which has prevailed until recently, that the oil must undergo a preliminary treatment to convert it into a gas or a vapor before trying to burn it. The failure of these generators is said to have

been common. The successful burning of oil without preliminary treatment is given as chiefly due to the adoption of a low-pressure burner, a suitable combustion chamber and means for independently controlling the oil and air supplied. The greatest source of economy over coal and coke has been found to be due to the increase in output made possible by the use of these oil furnaces, this increase ranging from 50 to 300 per cent., and hence reducing shop costs. The explanation is that this increase in output is made possible through the perfect and easy regulation obtained with oil; the time of the men is wholly given to their work and not to tending fires; there is less loss of material through faulty heat treatment and no labor is required for bringing fuel to and removing ashes from the furnace as is necessary in burning coal and coke. The reduction in the cost of fuel through the use of oil is put between 25 and 50 per cent. The Ferguson furnaces are described in detail.

The National Fire Proof Paint Company, 40 Dearborn street, Chicago, sends us a pamphlet entitled "Forearmed Against Fire." This concern makes fireproof paint and the pamphlet not only describes the uses of that paint and tells something of its qualities, but describes public tests and their results. A number of testimonials are given from people who have used and tested the paint. The company supplies a transparent fireproof liquid which is the fireproof material used in all its products. It also supplies fireproof lubricating oil.

The Engineers of the Navy.

In his annual report Admiral Melville, Engineer-in-Chief U. S. N., has something to say of the results of the administration of the personnel bill and the effects on the service. In his opinion the loss in efficiency in the engineering staff has been serious, not to say alarming.

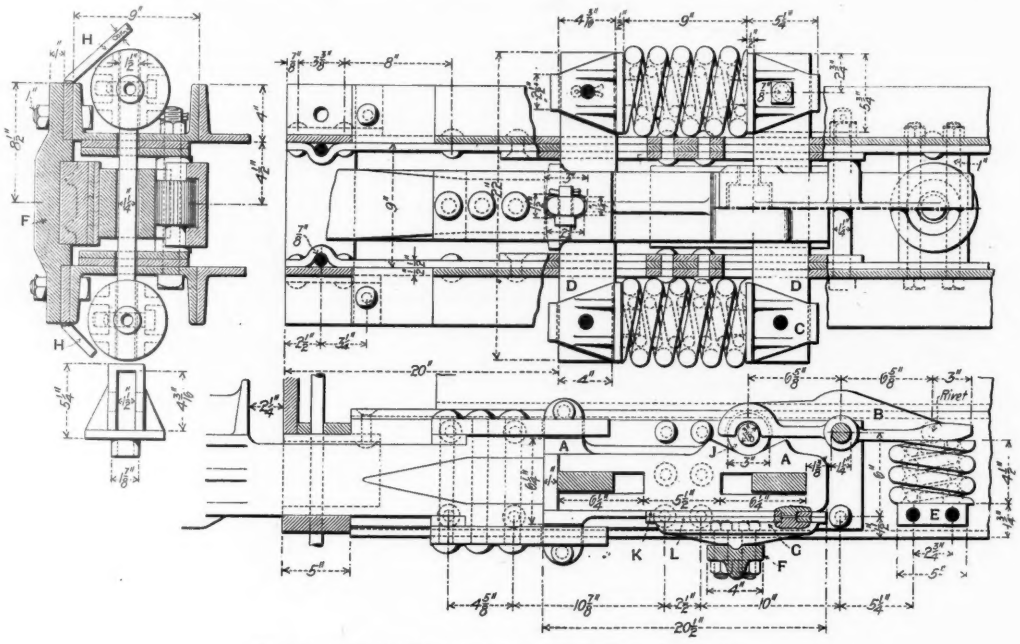
"Ever since the passage of the personnel bill I have contended that the measure of success to be secured from the law would be altogether dependent upon the manner in which it was interpreted. It was certainly the expectation of the Congress, and also of the personnel board, that the status of engineering in the navy would be advanced by this law. . . . I am simply stating a fact when I assert that the number of trained and expert engineers in the navy is being steadily reduced. The practical working of the amalgamation scheme thus far has been, in great part, to take the junior half of the old engineer corps and transfer them to line duties. Individual officers of the old line have conscientiously striven to perfect themselves in engineering duties, but up to the present time no systematic measures have been taken to train officers for the engineering needs of the future . . . As a result of this inadequate supervision in the engine rooms there has been a perceptible decrease in the efficiency of the machinery and a progressive increase in the cost of repairs. . . . During the past year the disablement of torpedo boats has been of such frequent occurrence that the majority of the boats have been under repair a great part of the time. Many of these mishaps are serious in character, and the present condition of the flotilla affords an incontrovertible argument in favor of the proposition that practical engineering ability of high order is required for their successful care and operation. In my opinion, the machinery of the torpedo boat craft would not be in its present deplorable condition if engineer officers of experience had been detailed for supervisory duty in connection with the boats. It is strikingly significant that the decrease in machinery efficiency has been most marked in the case of the torpedo boats. With this type of craft it has been attempted to practically maintain the machinery in operation without the supervision of trained engineer officers. . . . The bureau has reason to eventually expect efficient service from the young line officers sent to engineering duty if such junior officers are made to understand that promotion only awaits those who qualify in this direction. . . .

"I strongly advise that a large contingent of the junior officers be sent to the various navy yards and to other stations where engineering instructions and experience can be secured. These junior officers should be detailed for engineering work exclusively. If additional duty is assigned by other bureaus it cannot be expected that competent officers for engineering work can be adequately trained. This is not a question of specializing along engineering lines. It is rather a question of preventing inefficiency and demoralization existing in the future. . . . When the personnel law went into effect we had an engineering corps that was recognized as the equal, if not the superior, of that possessed by any other naval power. This efficiency was secured because the junior officers of the old engineer corps had been taught the lesson that to attain success much disagreeable work had to be done and many unpleasant duties performed. Those who are to succeed to the duties of the old engineer officers must be taught the same lesson of interesting themselves in the difficult as well as the attractive work of the profession. The deep-seated prejudice that existed in the navy against engineering duties has not altogether been eradicated, and from this cause it will be a difficult matter to create the interest and enthusiasm in this work that can be secured from more congenial and conspicuous assignments. It may not require much persuasion to induce many junior officers to acquire a superficial knowledge of engineering principles. It will need determined action, however, to compel a number sufficient for the engineering needs of the future to qualify to a degree that will make them proficiently capable of performing this important duty."

A Combination Twin Spring and Friction Draft Gear.

September 27 last, we illustrated an auxiliary spring and friction device which Mr. J. A. Hinson, President of the National Car Coupler Co., has designed for use in connection with any of the spring draft gears now in common use. The same principle is embodied in a recent spring and friction draft gear brought out by Mr. Hinson and shown by the accompanying engraving, as attached to 9-in. steel channels reinforced by ½-in. steel plates. Referring to the engraving, A is the cast steel yoke; B, friction bar; C, spring guides; D, follower bars; E, the seat for the rear spring; F, tie strap and friction plate support; G, equalizer plate; H, brace; J, steel roller; and K and L are friction plates.

The part which takes the place of the yoke is a steel casting with openings corresponding to openings in the webs of the draft sills. Follower bars, 1¼ x 4 in., extend through these openings. Between the ends of the follower bars, and outside the draft sills, are two 9-in. double coil springs. On the upper side of the yoke casting, A, are inclined surfaces both in front and back of the roller. The roller is held by the pivoted bar B, having the rear end resting on a double coil spring of 20,000 lbs. capacity. The pin which passes through this bar and forms the pivot, also passes through the draft sills making a fixed point. When the coupler moves forward or back, the roller is moved upward by the action of an inclined surface and the spring at the rear is compressed. The same action puts the friction plates K and L under pressure. The friction plates are kept in place by the bosses cast on the yoke and on the equalizing plate. The equalizing plate is free to rock on the tie strap, F, so that any raising or lowering of the coupler does not cramp the friction plates. By removing the tie bar, F, the friction plates can be removed.



Hinson's Combination Friction and Spring Draft Gear.

A modification of this gear is to eliminate the friction parts when a twin spring rigging remains; or further the usual yoke may be used and a spring placed between the draft sills, making a triple spring arrangement.

The President on the Interstate Commerce Law.

Below is a short extract from the President's Message, being his remarks on the Interstate Commerce Law. The President's best friends (and we are among them) would find it hard to discover here anything original or any evidence of serious study and meditation, and the color is quite wrong. It looks as if he had cut a leaf out of a report of the Interstate Commerce Commission written ten years ago. The President is so courageous and vigorous in thought and action that one cannot help considerable disappointment and feeling that he might better have not said anything at all about the Interstate Commerce Law.

"In 1887 a measure was enacted for the regulation of interstate railways, commonly known as the Interstate Commerce Act. The cardinal provisions of that act were that railway rates should be just and reasonable and that all shippers, localities and commodities should be accorded equal treatment. A commission was created and endowed with what were supposed to be the necessary powers to execute the provisions of this act.

"That law was largely an experiment. Experience has shown the wisdom of its purposes, but has also shown, possibly, that some of its requirements are wrong, certainly that the means devised for the enforcement of its provisions are defective. Those who complain of the management of the railways allege that established rates are not maintained; that rebates and similar devices are habitually resorted to; that these preferences are usually in favor of the large shipper; that they drive out of business the smaller competitor; that while many rates are too low, many others are excessive, and that gross preferences are made, affecting both localities and commodities. Upon the other hand, the railways assert that the law by its very terms tends to produce many of these illegal practices by depriving carriers of that right of concerted action which they claim is necessary to establish and maintain non-discriminating rates.

"The act should be amended. The railway is a public servant. Its rates should be just to and open to all shippers alike. The Government should see to it that within its jurisdiction this is so and should provide a speedy, inexpensive and effective remedy to that end. At the same time it must not be forgotten that our railroads are the arteries through which the commercial lifeblood of this nation flows. Nothing could be more foolish than the enactment of legislation which would unnecessarily interfere with the development and operation of these commercial agencies. The subject is one of great importance and calls for the earnest attention of the Congress."

The Present Position of American Railroads.*

BY THOMAS F. WOODLOCK.

(*See the Railroad Gazette, Sept. 27, page 671, and Nov. 8, page 772.*)

In preceding articles I have tried to give in rough outline a sketch of the principal railroad systems of the United States, and of the changes in their internal relations resulting from the wholesale application of the principle of community of ownership and interest. I venture to offer now a few considerations of more or less general character affecting their position and immediate prospects.

And first as to general business conditions. There is, as I see it, little room for reasonable doubt that the great "boom" of 1897-1901 has seen its culmination, that the tide has turned to ebb, and that for the next three or four years we may reasonably look for diminishing business and more or less gradual contraction of confidence and credit. . . . The failure of the corn crop in many of the great corn-producing States, the over-financing and over-speculation clearly reflected in our abnormally high exchange rates, the threatening aspect of the labor question, the growing feeling against organized capital, and the expanded condition of our banks—all these things are signs that, coming after four years of great prosperity and "bomming" stock markets, seem to me unmistakable in their significance.

I am speaking now of business conditions in the most general way. Even if my anticipations prove correct it by no means follows that our railroads have another 1893-5 period to face with its long list of defaults and receiverships. Indeed, I think I can give good reasons for the assertion that the next period of business depression will leave but a faint mark upon our railroad map. Let me adduce the following:

1. *The Character of New Mileage.*—There has been in the "boom" period of 1897-1901 very little railroad construction of a competitive or exploratory character. The total amount of railroad construction has been remarkably small compared to that of the eighties and early nineties. The largest part of the building that has been done has been to connect existing lines, fill in gaps, and generally round out existing systems. In other words, the new mileage has, in a vast majority of cases, found new business waiting for it, and has earned its own living from the first. Moreover, much of it has been paid for from profits. . . .

2. *Stability of Earnings.*—The character of the new

*Extracts from articles written for *The Economist* (London).

mileage above described has been such as to permit population to increase more rapidly than mileage, and thus to materially increase the stability of gross earnings per mile. Never in the history of the country did the railroads carry so much freight and so many passengers per mile of road as in the 12 months ended June 30, 1901. Much of the increase compared with 1894 and 1895 represents permanent growth which will not be lost in the coming depression.

3. *Reorganization and Refunding.*—Nearly all the railroads reorganized in the 1893-5 period were reorganized on the basis of net earnings then existing, which were lower than are likely to be seen again in the worst of times. Many of those which escaped reorganization have wholly or partially refunded maturing debt at low rates of interest, so that their fixed charges have been more or less diminished.

4. *Conservatism in Financing.*—The policy of all our great railroad companies has been the same regarding the use of profits. Not more than one-half or at most two-thirds of actual earnings have been paid away in dividends; the rest of the profits have been used to improve, rebuild, and equip existing property. Some roads —as, for example, Pennsylvania, St. Paul, Illinois Central, and North-West—have not paid to stockholders one-half of the real net earnings of their roads. All have heavily over-charged expenses for improvements disguised in maintenance accounts, and have further drawn heavily on admitted profits for the same purpose. Not a single large company is paying dividends to-day anywhere nearly up to its real capacity. Consequently, a large falling off can be endured in gross earnings before the real net earning capacity is reduced below dividend requirements.

5. *Greater Efficiency in Operation.*—The last five or six years have brought a real revolution in the science of manufacturing transportation. In brief, the productivity of the "service unit," or train mile, has been immensely increased by good management and improved physical conditions, so that the cost per unit of product ("passenger-mile" and "ton-mile") has been greatly reduced. This it is, more than anything else, that has brought about such marvelous resurrections as those of Northern Pacific, Baltimore & Ohio, Norfolk & Western, and others less noticeable. This it is which will bring about a similar state of things even in Erie (if the company can only get money enough to make the necessary improvements), and for many years to come it will be the distinguishing feature of our railroad practice. . . .

6. *High Standard of Management.*—Never before has there been so high a standard of ability and probity in railroad business as is to-day set before American railroad men. . . . The railroads to-day are as a rule officered and manned by men whose equals it would be hard to find in any other country, at least so far as combined honesty, energy, and ability are concerned. Many large companies are now recruiting their clerical force mainly from college graduates, and their mechanical and engineering staffs are drawn almost exclusively from technical colleges and schools. This can have but one result, as these men gradually rise to positions of power, responsibility, and trust, and that day is not far distant. . . .

The "community of interest and ownership" principle will be put to the trial of adversity in due time. Vice-President Oppenheim, of Chicago Great Western (whose persuasive eloquence has charmed many a million of dollars from the pockets of English investors for the building up of his road), puts it very neatly in saying that "community of interest" will be a success as long as it is in the interest of the community. . . .

Whether these great railroad alliances will influence very much anti-railroad legislation remains to be seen. It certainly looks as if the next election will be fought largely upon the "Trust" question, and the signs of the times clearly point to great labor unrest in the next depression, so that, as people here term it, a "hot campaign" is inevitable. . . .

On the whole, I think it can fairly be said that the companies have, in the "community of interest" principle, a good economic line of defense against wind and weather. As long as the principle is applied to its proper use it will be effective. It will not long survive, however, if it be used for purposes of aggression.

In concluding, I should like to impress upon the English reader and investor that the strong points of our railroads are, first, their most careful and restricted use of capital; second, their extreme conservatism in the distribution of profits; and, lastly, their most efficient management and conduct of operations. These are points which should give the securities of our largest and strongest systems a high value in the eyes of shrewd investors.

The Bagdad Railroad.*

In 1899 there were 1,540 miles of railroad in Asiatic Turkey. Omitting the branches, the trunk lines of Asiatic Turkey were the Beirut-Damascus-El-Mugerib and the Jaffa-Jerusalem, in southeastern Asia Minor and Anatolia, in the west part. The Anatolian line is the only one of these which is serviceable in the projected route to Bagdad. This road starts near Scutari, across the Bosphorus from Constantinople, and runs along the coast of the Sea of Marmora for a short distance, thence striking off along the Sakaria River to Eskischer, where the line divides, one branch going to Karahissar, the center of the opium traffic, and the other to Angora. The present terminus of this branch is the city of Koniah, southwest of Angora, and it is at Koniah that the Bagdad line, properly speaking, begins. The route thence is eastward to Adana, which is considered a very important strategic point in eastern affairs, with its neighboring harbor of Messina.

From Adana, on the Mediterranean side, not far north of the Palestine coast, the line is projected to the Euphrates, by way of Marasth and Aintah, and it crosses the river in the neighborhood of Biredjik; thence through Kurdistan, eastward to Orfa, the ancient Odessa, and north to Diabekr, on the Tigris. The route then is southeast, along first the right bank of the Tigris and then the left, through Mosul, the ancient Nineveh, Erbil, Kerkuk and Deli-Abbas to Bagdad.

At Bagdad, the railroad is again to cross the Tigris and make its way south to the ruins of Babylon, on the Euphrates, which is then followed, along the right bank, to Bassa. Here the proposed line divides, and is to make the ports of Kuet and Mohammera, on the Persian Gulf, its termini. The proposed length of the route from Koniah to Bagdad is about 1,600 km., and if the line is built, it is assumed that the Bosphorus will be bridged to make connection between the railroads on the Constantinople side and Anatolia.

The chief interest of the Bagdad railroad lies in the fact that it proposes to reinstate the ancient land route to India, with modern facilities for travel. There was formerly an important traffic between India and Bagdad and return, which might be restored, and in addition, the new line would prove only about a third as long for the traveler as the present route through the Suez. If the Bosphorus bridge was built also it would be feasible to go from Calcutta to Hamburg in 12 days.

But the present local traffic which such a line could handle is the most important phase of the question, since the territory through which the road would pass, in connection with that which would naturally serve as a feeder, is greater than France, Germany and Austria together, and has an estimated population of 20 millions. The Anatolian railroad now carries annually 250,000 tons of grain, 10,000 tons of coal, 40,000 tons of cotton, and large amounts of iron, small wares, petroleum and sugar, and the Bagdad line would make Turkey an important figure in the producers for the world's grain market.

The Bagdad Railroad has been at a standstill, awaiting negotiations with the Turkish government, which are apt to drag. These are not completed yet; but it is said that the concession will be granted to the German Bank as the representative of the French and German capitalists interested in the project. The sticking point in the negotiations now seems to be the amount of earnings to be guaranteed by Turkey. However much or little it may promise, it is doubtful whether it will perform, or can perform if it will.

*Partly compiled from an article in the *Organ für die Fortschritte des Eisenbahnwesens.*

TECHNICAL.

Manufacturing and Business.

The Three Rivers Supply Co., Three Rivers, Mich., has sold its interests in the Ross & Holden crossing alarms to the Railroad Supply Co., Chicago, which company will make them hereafter.

After long tests the H. W. Johns Manufacturing Co. has put on the market a packing to be used on plungers and rods of pumps, delivering water at a temperature above 180 deg. F. In every test which has been made this packing has lasted six times as long as any other packing subjected to the same conditions.

Iron and Steel.

It is said that the daily output of the Colorado Fuel & Iron Co. amounts to 1,000 tons, and with the two new furnaces now building the company will have an additional daily capacity of 1,000 tons. One of these furnaces will probably be blown in April 1, and the other during the coming summer.

The Eleanor Iron & Steel Co., of Irwin, Pa., has contracted to sell to the United States Steel Corporation the output of its local plant for the next three years. The gross output will be about 100 tons daily and will be used at the McKeesport National Tube Works plant.

The Oklahoma Bridge & Steel Structure Works, of Enid, Okla. T., has secured a charter in that territory, with a capital stock of $100,000.

The Wilmot & Hobbs Mfg. Co., of Bridgeport, Conn., which owns a large rolling mill, has been absorbed by the American Tube & Stamping Co., and it is the intention of the latter company to add an open-hearth steel plant of an approximate daily capacity of 300 tons.

W. D. McKeefrey, of Leetonia, Pa., has been elected trustee of the Continental Iron Co., operating the Wheatland Rolling Mill at Wheatland, Pa., succeeding R. S. Henderson, resigned. It is said the trustees are authorized to spend $30,000 for additional equipment.

Wm. K. Kurtz and Wm. B. Kurtz, Elwood W. Porter and others, of Philadelphia, will make application in Pennsylvania, on Dec. 16, for the incorporation of the Coatesville Iron & Steel Co., to rebuild and operate the Valley Rolling Mills located north of Coatesville, Pa.

A new world's record for blast furnace production was made on Nov. 20 by No. 3 furnace of the Carrie group of the Carnegie Steel Co., at Raukin, Pa., when 790 tons of basic iron was made in 24 hours. This exceeds the best previous record made by one of the Duquesne stacks of the same company by 59 tons.

Iron Age, in its review of the past week, says: "Nothing has occurred to indicate any danger of an early subsidence of the great activity which characterizes the iron and steel trades. Not only are more iron and steel now being made and consumed in the United States than at any previous time in the history of this or any other country, but members of the trade are beginning to prophesy a still larger business the coming year. The full capacity of the blast furnaces and steel works completed and in process of erection seems to be imperatively needed to meet the requirements of the country for the greater part of the first six months of 1902."

The Malleable Iron Works, of Lancaster, N. Y., is reported ready to be reorganized by the following: H. H. Hewitt, of Buffalo, President of the Magnus Metal Company; W. D. McKeefry, of Leetonia, Ohio; Fred R. Green, of Fredonia; H. C. Rich, of Cattaraugus; John Remers, of Lancaster; John O. Garretsee, of Lancaster; C. D. Rood, Springfield, Mass.; Hon. John S. Lambert, Fredonia; C. E. Rood, of Buffalo, and Edward C. Randall, of Buffalo.

The Union Trust Co. has been appointed receiver for the Hartman Mfg. Co., of New Castle, Pa., which has been building an open-hearth plant at New Castle; also rod mills and a wire plant. It is said this company has its product sold three months ahead and has practically two new plants in operation.

Hasam & Moreno, of the City of Mexico, is reported to be about to start a rolling mill consisting of a 12-in. train of bar rolls to make bars from scrap. They also have decided to put in a water gas plant. This equipment, through the means of gas engines and dynamos, will enable them to drive their whole machine shop electrically.

Walter West and Harry Morgan, of Trenton, N. J., are reported interested in a company that will build a large plant to make chains. The company, which will soon be incorporated, will have a capital stock of $500,000.

The Laramie Rolling Mills, Laramie, Wyo., operated by the Colorado Fuel & Iron Co., is reported sold to John W. Gates.

The Sharon Steel Co. has let a contract to the Fisher Foundry & Machine Co., Southside, Pittsburgh, Pa., for its pipe mill equipment.

The Engineer School of Application.

Regulations have been issued by the War Department providing for the government of the new Engineer School of Application, recently established at Washington Barracks, Washington, D. C., and noted in this column at the time. The purpose of the school is to give instruction to such army officers as are ordered there: to prepare the younger officers of the Corps of Engineers for the active work of their profession; to provide thorough theoretical and practical instruction for engineer troops; to make researches in such branches of science as relate to the duties of the Corps of Engineers, to disseminate information so obtained and to make such experiments and recommendations and give such instruction as may be necessary for the military engineering work of the army. The four branches of instruction will be: Military engineering; civil engineering; mechanical engineering and electrical engineering. Detailed courses in these branches have been prepared by Major W. M. Black, Commandant of the School, and approved by Gen. W. L. Gillespie, Chief of Engineers. The term of instruction will be two years, beginning each year on Oct. 1, for engineer officers; and 10 months, beginning Oct. 1, for other officers. The period from Nov. 1 to May 1 will be given to theoretical instruction and the rest of the year to practical work.

Machinery for Washington Navy Yard.

The Chief of the Bureau of Ordnance, Navy Department, in his annual report, says that plans have been prepared and bids asked for installing automatic coal conveyors at the Washington Navy Yard, and says a steel castings plant of small capacity is urgently needed there.

Drill Grinder Patents.

A decision has just been rendered by Judge Wing in the Circuit Court for the Northern District of Ohio, sustaining the validity of two patents on drill grinding machines owned by the Worcester Polytechnic Institute, and under which the Washburn shops of the Institute are manufacturing. These patents cover devices essential to the efficiency of drill grinding machinery and this decision is of interest to manufacturers of this class of machinery and to the trade generally. A suit is now pending against parties who have been manufacturing the "Yankee" drill grinder.

Robins Belt Conveyors On the D., L. & W.

We gave illustrated descriptions of the Robins belt conveyor in the *Railroad Gazette* on pages 191, 320 and 516 of the current volume. Among the illustrations of the first article was one showing a Robins conveyor in the D., L. & W. R. R. Co.'s power plant at Scranton, Pa. We also mentioned a generally similar plant that was put in at the Hoboken, N. J., power house of the D., L. & W. This plant is doing good work. A hopper beneath the track feeds the coal into a 12-in. belt conveyor, which carries it into the building and distributes it through the

storage bins by means of an automatic tripper. The contents of a 25-ton car are stored away in half an hour. Robins belt conveyors have perhaps had a more severe and general test in boiler house work than in any other capacity. For this work, the especial advantages claimed for them are the small space and light supports required; the automatic distribution of the coal at any required number of points; the small amount of attention needed and the noiseless but rapid operation. Ten or more belt conveyors have also been installed by the D., L. & W. R. R. Co. for handling coal at their coal breakers and locomotive coaling station.

An Important Stone Arch Bridge.

The Pennsylvania Railroad Company is asking bids on a four-track stone arch bridge over the Raritan River at New Brunswick, N. J. This will consist of 12 spans of 66 ft. in the river, and two spans of 45 ft., six spans of 52 ft., and one ribbed span of 70 ft., on the land. The river spans will be about 62 ft. from the mean level of the water to the coping; and the land spans from 45 to 50 ft. The plans and specifications for this work may be seen now at the office of the Chief Engineer and bids will be received until 9 a.m., Dec. 10.

The New East River Bridge Cables.

The new East River Bridge Commissioners (New York City) have decided to allow an extension of six months, from Oct. 1, 1901, to the John A. Roebling's Sons Company in the contract for stringing the cables for the new bridge. The company had asked for an extension of 10 months.

Hydraulic Dredges.

The large hydraulic dredge "J. Israel Tarte" was tested in Toronto Harbor on the 26th inst. This dredge, for the improvement of the St. Lawrence route, was built by the Polson Iron Works from designs by A. W. Robinson, M. Am. Soc. C. E., Consulting Engineer to the Canadian Government. It has a steel hull 160 ft. x 42 ft. x 12 ft. 6 in., and is designed to dredge clay from 50 ft. deep at the rate of 2,000 cu. yds. per hour, and deposit it 2,000 ft. distant. It is capable of making a cut 300 ft. wide, being provided with a lateral feed and anchorage lines. Mr. Robinson has just completed a smaller dredge of 600 cu. yds. per hour capacity for British Columbia, which is now in service, and he is at work on designs for a large dredge for the Maritime Provinces, which is intended to work in hard material in 56 ft. of water.

Steam Distribution for Locomotives.

At the October meeting of the North-West Railway Club, Mr. H. T. Herr, division master mechanic of the Chicago Great Western Railway, presented a paper, "Reflections on Steam Distribution for Locomotive Engines," in which the effects of various valve setting was considered at great length. The matter gives new zest to many debatable points and the nice adaptation of the Zeuner and Harmonic valve diagrams to many complex problems is illustrated. The paper in its completeness will be found well worth filing for reference. We reprint herewith only the conclusions. The discussion will be found in the November proceedings of the Club.

Conclusions.—The design of the valve motion as a whole, is as important as any other single element of the locomotive, and in its solution consideration should be given to the nature of the service to which the engine will ultimately be assigned, as outlined in the body of this paper. The distribution of the steam at the probable running cut-off is the most important point for the proper action of the valve motion, and its elements. That the full gear adjustment should not be allowed to influence the setting of the valve to the detriment of the running cut-off. That a greater reduction of lead than is generally found in practice is advisable, as is also an increased outside lap and travel. That some form of double or multiple-ported valve is valuable, and should be used, especially in high-speed work. That the Zeuner and Harmonic valve diagrams are material aids to the solution of all slide-valve problems, the latter especially so because it is possible to design an instrument to take such diagrams from an engine in actual service, and thus study the effects of valve setting.

Pulley and Clutch Tests.

The following information is from reports of tests made at Worcester Polytechnic Institute with pulleys and friction clutches fitted with the Allston Foundry Co.'s (Boston) cork inserts. The tests show that when the belt is in the least favorable condition for the "Compo" iron pulley with cork inserts, this pulley carries more load with allowable slip than any of the others, and when the belt is in the least favorable condition, i.e., dry, for the plain iron, wood, and wood with leather face, the increase in favor of the "Compo" pulley is more marked. From the average results of over 100 tests, the "Compo" pulley at a point of 2 per cent. slip, which is considered allowable in commercial practice, shows an increase in its power-transmitting capacity of 51 per cent. over the plain iron pulley. In the report on clutch tests it is said that the cork-inserted clutch has less tendency to slip under the same load and with the same pressure upon the faces of the clutch than the one with the leather face; and that it is capable of transmitting about twice as much power as the leather-faced clutch, with the same total pressure on the faces of each clutch. Therefore, with each clutch, transmitting the same amount of power, about one-half as much pressure is required in the case of the cork-inserted clutch as in the other.

THE SCRAP HEAP.

Notes.

A Montgomery (Ala.) paper says that the Plant System has discontinued the use of the pay car.

The State of Pennsylvania has begun suits against three street railroads of Pittsburgh to enjoin them from carrying freight.

A railroad club is to be formed in Milwaukee. The principal movers in the project are traffic men.

A number of division superintendents met at Des Moines, Iowa, last week to see about establishing a state railroad men's club.

Last week we spoke of the feasibility and probable desirability of connecting passenger trains with city telephone lines so as to make this means of communication available for passengers in the trains while waiting at stations. We now read in a Milwaukee paper that the Chicago & North Western is planning to adopt this idea on its Overland Limited trains.

We noticed recently (page 812) that the Atchison, Topeka & Santa Fe would make certain changes in the administration of discipline without suspension. It appears that when the new rules go into effect the records of all employees will be cleared of past debits, except those who have 60 or more demerits against them; these will have their debits reduced to 40.

A brakeman on the Chicago Great Western lately brought suit in the United States District Court against the company for $5,000 for injuries received while coupling an engine to a car, at Marshalltown, Iowa, on the ground that the company was liable under the coupler law for failure to equip its engines with automatic couplers, but Judge Smith McPherson (Southern District of Iowa) took the case from the jury, deciding that the law in regard to automatic couplers for cars does not apply to engines. This is said to be the first time a Federal Court has had this question before it.

The Supreme Court of the United States has declared unconstitutional the law of Kansas fixing the maximum charges by live stock associations for handling and feeding cattle, sheep and hogs, these rates being about 50 per cent. less than those fixed by the associations. The court was unanimous in the reversal of the opinion to the contrary held by the United States Court for the District of Kansas. Justices Harlan, Gray, Brown, Shiras, White and McKenna concur in this action as far as the merits of the case are concerned, on the grounds that the statute of Kansas is in violation of the Fourteenth Amendment to the Constitution of the United States, because that law applies only to the Kansas City Stockyard Company and not to other companies engaged in like business in the State, and thereby denies to that company equal protection of the laws. Upon the question whether the statute is unconstitutional because it would deprive the company of its property without due process of law, the six justices named do not deem it necessary to express an opinion. In the majority opinion, delivered by Justice Brewer, the court directs that the decree of the lower court be reversed, and a decree entered in favor of the stockyards company and against the State.

The new union station at Richmond, Va., built for the use of the Chesapeake & Ohio and Seaboard Air Line, was put in service on Nov. 27. This station was described in the *Railroad Gazette* of July 13, 1900.

The third heavy shipment of mail from Australia to England, by way of San Francisco and New York, passed through this city Nov. 30. The 460 sacks weighed about 16 tons. The newspaper accounts say that the steamship and railroad lines carrying this mail "expect" to secure a permanent contract from the British government; which statement seems to indicate that the former announcement, that the contract had been secured, was premature, though the statement was vouched for by a railroad officer who ought to be fully informed on the subject.

Freight traffic at Pittsburgh, which has been badly congested for several weeks on account of the great volume of business, was still more seriously disturbed last week by a strike of switchmen; the Switchmen's Union of North America, a comparatively new organization, having ordered its members to strike. It appears, however, that only about half the men in the yards of that city belonged to the union and the strike quickly proved ineffectual, except on the Allegheny Valley Division of the Pennsylvania, where traffic was considerably interrupted for several days. On all the other lines enough new men were secured to prevent much delay in switching. Nevertheless the delays due to the strike, with those caused by the congestion previously existing, have continued to cause great annoyance and many large manufactories have had to suspend work for a time for lack of coal.

Traffic Notes.

A colony of a thousand Quaker families is to be established on the line of the Atchison, Topeka & Santa Fe, in Colorado. The colonists will go from Ohio, Indiana, Illinois and Kansas.

It is reported that the Great Northern Railway is to make unusual efforts to institute an elaborate "campaign" this winter, in advertising the resources of the Far Western States to the people of the East, and of Europe, where immigrants may be looked for.

It is said that a large number of ticket scalpers have lately appeared in Charleston, S. C., expecting to do business in that city during the exposition. The City Council has adopted an ordinance requiring a license fee of $500 from each broker.

The United States Circuit Court of Appeals, at New Orleans, has decided against the Louisville & Nashville Railroad in a suit which was begun about six years ago, complaining of discrimination against the town of La Grange, Ga., in rates on sugar and other articles from New Orleans. The decision sustains the original opinion of the Interstate Commerce Commission.

Who Is An "Official?"

We noted recently that the courts in Austria had decided that a street car conductor is not an official. Now they have decided that the motorman and conductor of a trolley car are officials. A man driving a wagon was in the way of a car and quarreled with the motorman and called him names. The motorman told the conductor to take down the driver's number, but the latter drove away, and when the conductor overtook him threatened him and struck at him with his whip. He was arrested and charged with insulting officials. The defense denied that conductors and motormen were officials, and sought to prove his assertion by the fact that these people take tips, while the law forbids officials to take them and provides penalties for offering them to officials. But the court affirmed their official character. As to the tips, in Vienna, and perhaps in some other places where very small coins are current, when a fare is 8 or 9 of such coins worth less than half a cent, it is not uncommon for a passenger who pays his fare with a coin worth 10 of these to let the conductor keep the change.

The New York Central's Tunnel.

Mr. Wilgus, Chief Engineer, has given the following "interview" to the daily papers. It doubtless sums up the situation correctly: "It is a fact that the New York Central Railroad Company is making a careful and thorough study of methods for relieving the difficulties due to the Park avenue tunnel and the heavy suburban traffic. We are anxious to solve these problems as soon as we can; we are working as fast as we can. But for the method or relief finally adopted we shall be responsible; we shall have to stand for it. The investigation, therefore, has covered a wide field; we are going into the various questions rather more deeply than some of those engineers who seem already to know what ought to be done. Electric motors, compressed air, superheated water, and a variety of other systems are in course of investigation. The General Electric Company has made certain studies at Schenectady in our behalf. Mr. Bion J. Arnold has come to New York to help with certain phases of the inquiry. It is not true, however, that definite conclusions have been reached. The study had not proceeded far enough to warrant a decision in favor of one system or another. We have not decided on electric motors. Nor are we so near the end of the study that I should be justified in forecasting its result. Neither should I care to say now how soon our work will be done, or how soon I hope it will be done. But we are doing our best to bring it to completion as speedily as the difficulty and the importance of the matter permit."

Water Works Tunnel at Washington.

The tunnel at Washington, D. C., known as the Lydecker tunnel, built to carry water from the distributing reservoir on the Potomac River above the city to the new Howard University reservoir in the city, a distance of about four miles, has been completed and water was turned into it on Nov. 25. The new reservoir has a capacity of 300,000,000 gals. and with the new tunnel will give a supply of 100 gals. a day for each inhabitant of the city. This tunnel was begun in 1882 and up to 1888 a total appropriation of $2,575,279 was made for it. Owing to defective workmanship on the linings of the tunnel, work was stopped on it for seven years and its reconstruction was begun in July, 1898, under Col. Alexander M. Miller, Corps of Engineers, U. S. Army, in charge of the Washington Aqueduct. The total appropriation for the reconstruction was $933,180, and the work was finished within that amount. The tunnel is about 11 ft. in diameter and 20,696.3 ft. long.

Shiré Highlands Railway—East Africa.

A contract for the construction of a railroad between Chiromo and Blantyre, with provisions for an extension to Lake Nyassa, has just been concluded between the British government and a company registered under the title of the Shiré Highlands Railway, Nyasaland, Limited. The carriage of goods through the Protectorate of Nyasaland is altogether by native porterage. Under the agreement now entered into between the Imperial Government and the Shiré Highlands Company, the road is to be 3 ft. 6 in. gage, and to lie wholly within the Protectorate. It is stipulated that the actual construction shall commence within 15 months from the date of the contract. While the Imperial Government concedes that all plant, materials and provisions for the laborers engaged in the work may be imported duty free, and that no competing line shall be allowed within the Protectorate for 25 years, it reserves to itself the right to purchase at any time after the expiration of that period on giving 12 months' notice to the company. The Board must be composed entirely of British subjects. This line will connect the centers of the coffee industry with the sea by way of the Shiré and Zambesi rivers, and will otherwise benefit the chief industries of the country by releasing for labor in the plantations the natives who have hitherto been engaged in transport.

American Locomotives in France.

The United States Consul General at Marseilles writes: "A great deal of interest has been manifested in this portion of France in the experiments of the Paris, Lyons & Mediterranean in importing a number of American locomotives. The first delivery was made in this city in March, since which time the locomotives have been in process of erection in the company's shops at Arles. I have been informed by one of the officers of the company that after these machines had been erected, the controlling forces of the roadmaster's department objected to their use, because of the fact that the weight was unevenly distributed over the various sets of wheels. It was thereupon concluded to make such changes as would evenly distribute the weight. This has now been done, and the machines are in partial commission. A local newspaper of to-day supplies these additional details: 'Yesterday morning the first time the rapid express No. 7 was conveyed from Avignon to Marseilles by one of the new American locomotives erected at Arles. This machine, No. 2999, was attached to a train of four large cars of the first class, weighing 34 tons, and two baggage cars, the total weight being 181 tons. The speed

attained has exceeded at certain moments 77.67 and 80.77 miles per hour upon this portion of the track, which, by reason of its favorable condition, lends itself better than any other to these interesting and important experiments, the results of which, from the point of view of regularity of speed and general stability of these new engines, have been most satisfactory.'"

The Channel Tunnel.

The annual general meeting of the shareholders in the Channel Tunnel Company, Ltd., was held in London, Nov. 13, Baron D'Erlanger presiding. The Chairman observed that the only event which had affected the company in the past year had been the death of Sir Edward Watkin, which had undoubtedly left a great gap in the ranks of the promoters and defenders of the Channel tunnel scheme—a gap which would not be easily filled up. An enterprise such as the company's, however, did not depend on one man. They would all remember their late chairman's spirited speeches at their meetings, and also how strong his conviction was as to the ultimate success of the undertaking. He had himself of late been frequently asked by friends why he had taken up the task which had been left unachieved by Sir Edward Watkin. The Channel tunnel scheme would impress itself on the attention of the public from time to time, and he believed that it would eventually be carried out. To make progress, however, the circumstances must be favorable, and it must be confessed that as regarded their enterprise those circumstances did not at present exist. They must, therefore, continue to exercise patience, as they had done in the past. Their investments earned them last year £800, while their expenses had been only £400. Few companies were administered at as little cost as theirs.

The Czar's Railroad Journey in France.

On the occasion of the last visit of the Czar to Compiegne, the train weighed 280 long tons behind the tender, and was composed of eight coaches. From Dunkirk the engine was 3198, a six-coupled 10-wheeler, 69-in. wheels, DeGlehn compound; and the speed attained was very good. On the occasion of the visit to the maneuvers, 2,642, the Atlantic Exposition engine was used and did some fine work. The company was unable to use the Atlantic from Dunkirk, as the bridges would not carry her.

Don't Want Pensions.

The proposed plan for pensioning Michigan Central Railroad employees was shelved and the failure of the movement seems to be assured. The convention, called for the purpose, took up consideration of the plan proposed by a committee. Strong opposition to several important sections developed, when a committee was appointed to draft new sections in their stead. The committee could not agree upon the points in controversy, and recommended an adjournment sine die, which was taken. The failure of the idea was due to a quiet general sentiment that with proper frugality pensions were unnecessary and that they would tend to promote improvidence.—*Kalamazoo Telegraph.*

New York City Bonds.

Controller Coler will award contracts, on Dec. 12, for $7,891,000 of bonds, divided as follows: $2,500,000 for the rapid transit tunnel, $1,000,000 for schoolhouses and sites in Manhattan and The Bronx, $900,000 for schoolhouses and sites in Brooklyn, $200,000 for schoolhouses and sites in Queens, $750,000 for the New East River Bridge, $750,000 for the Blackwell's Island Bridge, $150,000 for the Harlem River Bridge at 145th street, $250,000 for the same bridge, $650,000 for the Department of Docks and Ferries, $241,000 for the Fire Department, and $500,000 for the New Aqueduct.

Baltimore's New Dry Dock.

The new dry dock of the William Skinner Shipbuilding & Dry Dock Company, at Baltimore, Md., the second largest dry dock in this country, was formally opened, Nov. 25. The basin of the dock is of timber. The gate is a steel caisson, giving an opening of 75 ft. 8 in. at the low water line with a depth of water on the sill of 22½ ft. The following are the dimensions: Length over all, 628 ft.; length on keel blocks, 600 ft.; width of entrance at bottom, 60 ft.; width of entrance at top, 80 ft.; width of dock on floor, 62 ft.; width of dock at coping, 125 ft.; depth of water over sill at low water, 22½ ft.

Monitors.

The monitor "Florida" was launched on Nov. 30 from the yards of Lewis Nixon, at Elizabethport, N. J. The "Florida" is the first to be launched of four monitors authorized by Congress. Like the others, the "Arkansas," "Nevada" and "Wyoming," she has a displacement of 3,214 tons, 2,400 i.h.p., and twin screws, with six guns in her main battery.

Three of the old monitors used in the Civil War have been condemned and will be sold at public auction at the League Island Navy Yard, where they have been kept for many years. They are the "Catskill," built by Ericsson, and the "Manhattan" and "Mahopack," built at Jersey City.

Passenger Fares On the Continent.

In Wurtemburg a Commission appointed to report on the subject of passenger fares recommends a uniform tariff, with rates of 1 pfennig per kilometer for workmen, students, children under 10 years and soldiers; 2 pfennigs for the third-class, 4 for the second and 8 for the first. One pfennig per kilometer = 0.383 cent per mile, so that the four rates would be 0.383, 0.766, 1.532 and 3.064 cents per mile. With these rates there would be no round trip, excursion or other reduced rates whatever and no baggage allowance. It is not probable that Wurtemburg will take action on this matter alone, but will endeavor to agree on a uniform rate with the other South German States, and, if possible, with the North German also. The latter, Prussia at least, seems inclined to insist on maintaining their fourth class.

Spittoons and Tuberculosis.

Dr. Périer, who is a learned man and a great surgeon, and is also the chief medical officer of the Northern Railroad of France, has recently contributed to the Academy of Medicine (Paris) a communication concerning the use of spittoons in the Gare du Nord. A philosopher has said that a spittoon is a vessel of iron or wood around which people spit. The Tuberculosis Commission had asked the railroad companies to put spittoons in various places and particularly in stations. The Northern Company installed in its Paris stations spittoons made on the models recommended by the Tuberculosis Commission and went further—it entrusted the service of those spittoons to people who had had special training in measures necessary to keep themselves from danger of contagion from that kind of occupation. These spittoons were installed about a year ago. Dr. Périer recently induced the station master to have count made of people passing and using two of these spittoons. This count was made for three days, during which 3,010 persons passed these spittoons; 42 of these persons spat on the floor, five in the spittoons. This census has the defect that it does not discriminate between those persons who tried to spit into the spittoon and those who deliberately spat on the floor; but it is sufficient to indicate that the dread of the poison of tuberculosis in the dust of such a place is not acute in the minds of the mass of the people. —*Journal des Transports.*

LOCOMOTIVE BUILDING.

The Vera Cruz & Pacific is having three locomotives built at the Baldwin Works.

The Seaboard Air Line is having 10 locomotives built at the Richmond Locomotive Works.

The Chicago, Burlington & Quincy has ordered 50 locomotives from the Baldwin Works.

The Chicago & North Western is having 15 locomotives built at the Rhode Island Locomotive Works.

The Colorado & Southern has ordered 15 heavy Consolidation locomotives from the American Locomotive Co.

The Erie has recently ordered 60 engines, placed as follows: 20 to the Baldwin Works; 25 to the Cooke Works, and 15, as reported last week, to Rogers.

The Blackwell, Enid & Southwestern has bought of F. M. Hicks, of the Hicks Locomotive & Car Works, Chicago, two 50-ton 18 x 26-in. cylinder freight engines, and one 17 x 24-in. passenger engine. These locomotives have American driver brakes, 9½-in. Westinghouse air pumps, air bell ringers, air sanders, U. S. metallic packing, asbestos lagging and 4,000-gal. tanks.

The Pennsylvania gives us the following general statement of its locomotive programme for 1902: For the Lines East orders have been placed with the Baldwin Works for 195 freight locomotives. In addition to these the company intends to build about 100 other locomotives at its own shops, which are likely to be divided about evenly between freight and passenger, making a total of about 300 for the Lines East. For the Lines West about 100 locomotives have been ordered, 50 freight from the Baldwin Works, 15 freight to be built at the Richmond Works of the American Locomotive Co., and probably 35 at the Juniata shops of the Pennsylvania.

CAR BUILDING.

The Chesapeake & Ohio has ordered 100 box cars from the Pullman Co.

The Chicago Great Western has ordered 16 coaches from the Pullman Co.

The Copper Range is having 50 rock cars built by the American Car & Foundry Co.

The Arkansas & Choctaw has ordered four cabooses from the Mt. Vernon Car Mfg. Co.

The New York Central & Hudson River has ordered 700 box cars from the Pullman Co.

The Seaboard Air Line is having 300 flat cars built by the American Car & Foundry Co.

The Chicago, Rock Island & Pacific will build 100 double-deck stock cars at the Horton shops.

The Southern Missouri & Arkansas has ordered 25 flat cars from the Mt. Vernon Car Mfg. Co.

The Atchison, Topeka & Santa Fe has ordered 33 coaches and 17 chair cars from the Pullman Co.

The Solvay Process Co. is having 10 freight cars built by the American Car & Foundry Co., at Milton, Pa.

Byrne & Speed have ordered eight freight cars from the American Car & Foundry Co., at Huntington, W. Va.

The Chenung Spring Water Co. has ordered one freight car from the American Car & Foundry Co., at Milton, Pa.

The Southern Cotton Oil Co. is having 30 freight cars built by the American Car & Foundry Co. at Milton, Pa.

The Philadelphia & Reading has ordered 1,150 coal cars and 1,000 box cars from the American Car & Foundry Co.

The Buffalo, Rochester & Pittsburgh has ordered 500 40-ton hopper cars from the American Car & Foundry Co.

The American Refrigerator Transit Co. has ordered 200 refrigerator cars from the American Car & Foundry Co.

The Fort Smith & Western has ordered 10 box cars of 60,000 lbs. capacity from the Illinois Car & Equipment Company.

The Pullman Co. is building one coach for the Nashville, Chattanooga & St. Louis, and six coaches for its own service.

The Vera Cruz & Pacific is having 10 freight cars built by the American Car & Foundry Co., at St. Charles, Mo.

The Illinois Car & Equipment Co. has received an order for 50 tank cars from a private concern in the Texas oil fields.

The Delaware, Lackawanna & Western has ordered 1,000 coal cars and 1,000 box cars from the American Car & Foundry Co.

The Georgia Southern & Florida was reported incorrectly last week as having ordered 200 cars from the Southern Car & Foundry Co.

The Atlantic, Valdosta & Western has ordered three freight cars from the Georgia Car & Mfg. Co. The order reported last week was incorrect.

The Northern Pacific has ordered 1,000 flat cars of 70,000 lbs. capacity from the American Car & Foundry Co., instead of the 1,000 coal cars reported last week.

The Manhattan Elevated (New York City) has recently ordered from the Wason Car Mfg. Co. 200 more cars, making 250 in all now being built by the Wason Company.

The Chicago & North Western has ordered 1,300 freight cars from Haskell & Barker, and also four coaches from the Pullman Company, in addition to the order reported Oct. 25.

The American Car & Foundry Co. is building two coaches and five box cars for the Cordoba & Huatusco; 43 tank cars for individual concerns and 92 cars of various sorts for different parties.

The Colorado & Southern has ordered 400 freight cars from the Detroit Works of the American Car & Foundry Co., and has placed an order for dump cars with the Ingoldsby Automatic Car Co., St. Louis.

F. M. Pease, Chicago, is building new cars as follows: For the Buffalo Drillers' Oil Co., 30 tank cars; for the Yellow Pine Oil Co., 25 tank cars; for the Keith-Ward Oil Co., 20 tank cars, and for the Lone Star & Crescent Oil Co., five tank cars.

The Atlanta & West Point will build 25 wooden coal cars of 80,000 lbs. capacity in its own shops. They will weigh 36,800 lbs. and be 36 ft. long and 9 ft. 5 in. wide inside. The special equipment includes Keystone steel bolsters; Lappin brake shoes; Westinghouse air-brakes; Ajax brasses; Tower couplers; Thornburg draft rigging; Harrison dust guards and pressed steel journal box lids. The wheels will be furnished by the Decatur Car Wheel Co.

The Chicago, Rock Island & Pacific has ordered 700 wooden box cars of 60,000 lbs. capacity from the Pullman Co. and 300 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co. The box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high. The refrigerator cars will be 39 ft. long over end sills and 9 ft. wide over side sills and about 7 ft. 5 in. high. The special equipment for all includes: Simplex and Bettendorf bolsters; Westinghouse air-brakes; Miner draft rigging and McCord journal boxes.

The Pennsylvania has authorized the building of 4,000 freight cars beside those recorded Nov. 15, and 3,225 of the new lot have been ordered as follows: 1,500, 30-in. side, steel underframe gondolas, 40 ft. long, of 100,000 lbs. capacity, and 225 Class X1 box cars from the Pressed Steel Car Co.; also 1,500 30-in. side, steel underframe gondolas, 40 ft. long of 100,000 lbs. capacity, from the American Car & Foundry Co.: 775 box cars of 100,000 lbs. capacity, with steel underframes and truck bolsters, Janney couplers, National hollow brake-beams, Winslow roof, Westinghouse brakes and Westinghouse friction draft gear; also 775 gondolas and 500 box cars from the Pullman Co.

The Pere Marquette has ordered 200 coal and 506 box cars, all 36 ft. long and of 60,000 lbs. capacity, from the American Car & Foundry Co., delivery 60 days. The special equipment of all includes Common Sense bolsters, Westinghouse air-brakes, Fulton brasses, Butler draft rigging, Harrison dust guards, McCord journal boxes, Detroit springs, Sherwin-Williams paint and Haskell pressed steel trucks. The box cars will have Chicago roofs. The company has also bought from the Rodger Ballast Car Co. 40 of their standard 40-ft. 40-ton Rodger ballast cars, and two standard distributing cars. This equipment has been in use on the Pere Marquette during the past season under rental and is now purchased.

BRIDGE BUILDING.

ALHAMBRA, CAL.—The Board of Supervisors and the Pasadena & Los Angeles Electric Ry., are considering building a larger bridge at East Main street.

ASCOT CORNER, QUE.—Wilfride Duplin, Town Clerk, is receiving bids for a lattice bridge across the St. Francis River; also for stone abutments. Plans may be seen at the office of L. A. Dufrene, Sherbrooke, Que.

BAKERSVILLE, N. C.—All bridges in Mitchell County have been washed away and we are told that the county officers will soon take steps to rebuild them.

BAY CITY, MICH.—Bids are wanted, until 4 p.m., Dec. 14, for a draw span over the west channel of the Saginaw River at Cass avenue. It will be 190 ft. long, with a roadway 16 ft. wide. J. H. Bomshield, Engineer, Bay County Bridge Committee.

BLOOMINGTON, IND.—Plans are being made by E. F. White, of Harrison Township, for a bridge over White River for the Commissioners of Monroe and Owen Counties.

BRANTFORD, ONT.—The city is reported negotiating with the Grand Trunk for the latter to build a bridge over the Grand River near the water works pumping station.

CANTON, OHIO.—The City Council is considering a resolution to build two bridges within the city limits. The bridges are to span Nimishillen Creek at West Third and Lake streets.

CHICAGO, ILL.—City Engineer Ericson, in his estimate for 1902, estimates the cost of 13 bridges of the bascule type at $2,100,000. Of these bridges two are to replace structures which are now out of service, and the remainder are to replace bridges which will be condemned during the year. The largest bridge recommended is at Kinzie street, to cost $225,000. A new bridge at Twenty-second street would cost $210,000, while the Northwestern avenue bridge will cost $200,000. Bridges at North Archer and Chicago avenues, Erie, Dearborn and Indiana streets are estimated to cost $175,000 each, while the Western avenue, Washington, Fuller, Weed and Division street bridges will cost about $100,000 each.

A footbridge is planned at 102nd street to cross the tracks of the Fort Wayne and Belt railroads.

CINCINNATUS, N. Y.—The present bridge over Otselic River will be replaced by a new structure at a cost of $6,000.

CLEVELAND, OHIO.—The Lake Shore & Michigan Southern has for a number of years been considering abolishing the long and heavy grade from the river edge to a crossing of Detroit street in the West End. A report last week says that it is proposed to build a viaduct, the western end of which will be at Detroit street, and the eastern end at Lake street, about 3½ miles. The height of the viaduct would be 100 ft. in some places.

DANVILLE, ILL.—M. A. Neville, Engineer Maintenance of Way of the Peoria & Eastern Ry. (Big Four) Indianapolis, Ind., will receive bids some time this month for a concrete bridge over the North Fork of Vermillion River at Danville. It will consist of two 50-ft. concrete arches. The cost is $108,000, including dirt filling over arches.

DANVILLE, PA.—The Pennsylvania R. R. is again reported considering a new bridge over the Susquehanna River connecting Riverside and Danville.

EL PASO, TEXAS.—The El Paso Electric Street Car Co. will build a viaduct over the tracks of the Santa Fe a mile west of the city.

FALL RIVER, MASS.—A new bridge will be built over Taunton River. The present bridge will be used for railroads only. P. D. Borden, City Engineer.

FORT DODGE, IOWA.—Surveys are reported finished for the proposed bridge and viaduct across the Des Moines River for the Chicago Great Western. It will be about 2,585 ft. long, and the proposed height is 134 ft. In addition to crossing the river, the viaduct will cross two railroads and four highways.

HARDIN, ILL.—A steel bridge is proposed over Mocoupin Slough, opposite Hardin, between Green and Jersey Counties, and it is proposed to apportion the cost of construction among Calhoun, Green and Jersey Counties. L. M. Davis is the Calhoun county member of the committee appointed to get plans and estimates.

HARRISBURG, PA.—T. L. Eyre, Superintendent of Public Grounds and Buildings at Harrisburg, will receive bids until noon of Dec. 27, for the substructure and superstructure of the proposed bridge over Sugar Creek in Bradford County.

JACKSONVILLE, FLA.—The Atlantic, Valdosta & Western will let contracts in about two months for some bridges needed on the extension from Valdosta to the Chattahoochee River.

JOHNSTOWN, PA.—The County Commissioners are considering a site recommended by the Grand Jury for the proposed bridge over Stonycreek River.

LAFAYETTE, IND.—Wallace Marshall informs us that he is making plans for the bridge on Brown street over the Wabash River for the County Commissioners. The structure will be 581½ ft. long and cost about $30,000. The county has not made the appropriation, but the plans will be ready in another week.

LEXINGTON, KY.—The Railroad Commissioners have decided that the Georgetown & Lexington Electric road shall build a bridge over the tracks of the Queen & Crescent at the proposed crossing. The estimated cost of the bridge is $8,000.

MEMPHIS, TENN.—Bids are wanted by W. W. Barksdale, Superintendent of Bridges, until Dec. 20, for a combination bridge over Wolf River, known as Houston bridge.

MOBILE, ALA.—The Louisville & Nashville, according to report, will rebuild the bridge at Rigolets.

MONROEVILLE, OHIO.—The Lake Shore & Michigan Southern, according to report, will bridge the Huron River at this place.

MONTPELIER, VT.—The Mayor is considering plans made by the American Bridge Co., for a steel bridge to replace the Rialto bridge. The Council will probably take action early in the spring.

NEW BRUNSWICK, N. J.—Chief Engineer W. H. Brown of the Pennsylvania, Philadelphia, Pa., will receive bids, until 9 a.m., Dec. 10, for building the four-track stone arch bridge over the Raritan River at New Brunswick, as mentioned in the advertising columns of the *Railroad Gazette*.

NILES, OHIO.—The County Commissioners have consented to build two bridges across Mosquito Creek in this city, each to cost about $6,000. The City Council is planning to build a tunnel under the Erie R. R.

PATERSON, N. J.—F. R. Long Co., New York, have the contract for the Monroe street bridge.

OSCEOLA, NEB.—W. O. Johnson, County Clerk, will receive bids until noon of Dec. 17 for a four-span bridge over Blue River on the road south of Stromsburg City. He will consider specifications and bids on both wood and steel bridges.

OSHKOSH, WIS.—The bridge committee is considering the question of whether it would be better to build a new bridge over Sawyer Creek or repair the old bridge. The estimated cost of a steel bridge is $7,000.

OTTAWA, ONT.—The question of building a subway on Elgin street under the Canada Atlantic tracks will again be taken up by the City Council at an early date.

PENDLETON, ORE.—The Washington & Columbia River Ry., we are told, will build a steel bridge over Umatilla River which will consist of two 150-ft. spans. The date for receiving bids for the superstructure is not yet decided, but the foundations are being built by the company. A steel trestle will be built at a point six miles south of Hunt's Junction at a cost of $30,000.

PLAINFIELD, N. J.—The Bridge Committee of the Board of Freeholders is considering building a bridge between Somerset and Middlesex counties.

PORT WALTHALL, VA.—The Atlantic Coast Line has made application to the Board of Commissioners of Chesterfield County for an undergrade crossing of the Richmond & Petersburg Ry., near Port Walthall Station.

PROVIDENCE, R. I.—The New York, New Haven & Hartford has let a contract to the Boston Bridge Works for a new double-track steel drawbridge to replace the present single-track bridge across the Seekonk River at Indian Point, Providence. The masonry contract is let to Holbrook, Cabot & Daly, New York.

A bill has been passed by the Rhode Island House and is now before the Senate which provides for the abolition of the grade crossings in the city of Providence.

ST. CLOUD, MINN.—John D. Morgan, City Engineer, informs us that a steel bridge 150 ft. long is proposed over Sauk River but there is litigation as to who shall pay the cost of the bridge. The contract cannot be awarded until this is decided.

ST. JOSEPH, MO.—It is again reported that the Chicago, Rock Island & Pacific is considering building the proposed bridge over the Missouri River at St. Joseph.

SANDUSKY, OHIO.—The question of building the Huron street bridge is again under consideration.

SANTA MONICA, CAL.—At the recent election it was voted to issue $25,000 bonds for bridge No. 1. The vote for bridge No. 2 was defeated.

STILLWATER, MINN.—The question of building a steel bridge over St. Croix River was again before the Council on Nov. 27.

VICTORIA, B. C.—The contract for building the Point Ellice bridge near Victoria is awarded to the Puget Sound Bridge & Dredging Co., of Seattle, at $92,000.

WAREHAM, MASS.—The Mackie bridge over the New York, New Haven & Hartford on the main street of Wareham Center will be replaced by a heavier structure.

WASHINGTON, D. C.—A bill appropriating $5,000,000 for the Memorial bridge across the Potomac was again introduced into the House when Congress assembled on Monday.

WELLSBURG, OHIO.—It is said plans for the bridge over the Ohio River, which are being made by Messrs. Bollar & Hodge, New York, for the Pittsburgh, Carnegie & Western (Wabash) will be submitted to the War Department soon. The main channel span will be about 700 ft. long. The total length will be 1,200 ft.

WOODSTOCK, VA.—The Board of Supervisors of Shenandoah County has appropriated $4,000 for an iron bridge over Shenandoah River near Stroudsburg.

WORCESTER, MASS.—City Engineer Frederick A. McClure tells us that there is no present prospect of building the bridge at Lake Quinsigamond.

Other Structures.

ALEXANDRIA, LA.—The Southern Pacific depot at this city was burned on Nov. 27.

ALEXANDRIA, VA.—The Southern Railway is building a new roundhouse at Alexandria. J. W. Taliaferro & Co., Brooklyn, N. Y., has the contract. The building will be finished April 1. The cost of the improvement is about $25,000.

BALTIMORE, MD.—C. N. Boulden, Secretary of the Litharge Paint Co., announces that the company is considering a site for its large plant which will consist of several buildings, probably located on the water front.

CHICKASHA, IND. TER.—Reports state that the Chicago, Rock Island & Pacific will spend about $100,000 in shop and terminal improvements at this place. The machine shop will be 20 x 118 ft. The boiler shop will be 42 x 80 ft. The roundhouse facilities are also to be extended.

DAVENPORT, IOWA.—The Tri-City (Electric) Ry. Co. will build car shops in Davenport and a new passenger station, which will also be used as a local office.

DECATUR, IND.—It is stated that the Grand Rapids & Indiana will build a new passenger station in Decatur in the spring. The plans are made.

DUNKIRK, N. Y.—The Erie R. R. is about to build a new roundhouse in the eastern part of the city.

GLASSPORT, PA.—The Pittsburgh Steel Hoop Co. has decided to build two additions to its mills at Glassport as soon as the mills at Monessen are finished.

GRAND RAPIDS, MICH.—The Pere Marquette Railroad has begun work on a $20,000 freight station on South Ottawa street in the southern part of the city.

INDIANAPOLIS, IND.—The Pennsylvania Co. is considering building a new passenger station in Indianapolis at a cost of about $100,000.

JOHNSTOWN, PA.—The Cambria Steel Co. has plans made for a large bolt, nut and axle plant, 850 x 1,200 ft. in size. Building will be begun at once.

KNOXVILLE, TENN.—The Knoxville Iron Co. will soon start work on its new rolling mill in the suburbs of this city. The plant will consist of a forge shop 80 x 376 ft.; furnace house, 68 x 220, and rolling mill 75 x 220. There will also be a warehouse, machine shop and gas producer house. The first three named buildings will be of steel construction. W. P. Chamberlain is President.

MCKEES ROCKS, PA.—The Fort Pitt Malleable & Gray Iron Co., recently incorporated in Pennsylvania, will soon let contracts for a foundry plant to be built adjoining the McKay Chain Works. The plant will cover about five acres with steel frame buildings and cost about $200,000. The company has an office in the Shannon Block, Fourth avenue, Pittsburgh. J. C. Reilly, of the Pittsburgh Trust Co., is President; F. J. Lanahan, Secretary and Treasurer; E. S. Reilly, Manager. M. J. McMahon, formerly with the McConway & Torley Co., is Superintendent of the company.

NEW HAVEN, PA.—Bids are wanted, Dec. 16, by R. M. McAdoo, General Manager, Pittsburgh, McKeesport & Connellsville Ry., for building the main power station, also the main car barn and repair shop at New Haven. Plans can be seen at the office of Westinghouse, Church, Kerr & Co., 26 Cortlandt street, New York, or at the office of the railroad company in Pittsburgh.

NEW YORK, N. Y.—The Long Island R. R. has plans ready for the terminal of its tunnel road under the East River to Manhattan Island, which is described in another column.

NORFOLK, VA.—A new machine shop will be built at the Navy Yard at Norfolk for the Equipment Department. The building will be two stories high, 65 x 250 ft.

OMAHA, NEB.—Plans are reported made for the new Burlington freight depot on Eighth street between Farnam and Howard streets, to cost nearly $100,000. Contracts, according to report, will be let soon. The structure will be 140 x 600 ft.

PHILADELPHIA, PA.—The Board of Port Wardens on Delaware improvements has approved the application of the Pennsylvania R. R. to build two piers between Walnut and Dock streets.

Contract for the new Pennsylvania R. R. passenger station at Fifty-second street has been awarded to Roydhouse, Ayer & Co. The building will be two stories high, of brick and stone.

PUEBLO, COLO.—A change has been made in the plans of the Colorado Fuel & Iron Co. for its new rod mill. It will have a capacity of 800 tons a day instead of 400 as originally intended. The wire mill will have a like capacity.

RAPID CITY, S. DAK.—The Fremont, Elkhorn & Missouri Valley will build a passenger station on Ralph street between Eighth and Ninth, in the central part of the city. The present location of the depot is about a mile from the city.

READING, PA.—The Philadelphia & Reading, according to report, is considering enlarging the Spruce street station.

SCRANTON, PA.—The breaker of the Green Ridge Coal Co. was destroyed by fire Dec. 3, with the boiler and engine houses, blacksmith shop and car sheds, causing a loss of about $110,000.

SHEFFIELD, ALA.—The United States Cast Iron, Pipe & Foundry Co., 80 Broadway, New York City, is considering building two blast furnaces in Sheffield.

SPENCER, N. C.—The Southern Ry. has recently begun work on an addition to the machine shops at Spencer.

STEUBENVILLE, OHIO.—The Labelle Iron Works proposes to build a new blast furnace, to be finished within a year.

STRATFORD, ONT.—The Grand Trunk is reported considering building a tender shop at Stratford to be 220 x 120 ft., costing about $15,000.

SYRACUSE, N. Y.—The Solvay Process Co. is reported to have made plans to enlarge its capacity.

WALLINGTON, N. Y.—The Rochester & Sodus Bay (electric) Ry. will build a large station in Wallington.

WOODWARD, ALA.—The Woodward Iron Co. will, in addition to renovating its two blast furnaces, build a third furnace. G. B. McCormick, formerly with the Tennessee Coal, Iron & Railroad Co., is General Manager.

YOUNGSTOWN, OHIO.—The directors of the Youngstown Iron Sheet & Tube Co., at a meeting held on Nov. 27, decided to add an open-hearth department. The capital stock of the company will be increased to meet the expenditure.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

Western Society of Engineers.

At a meeting of the Western Society of Engineers, Chicago, Wednesday evening, December 4, two papers were presented. One was by Mr. D. W. Mead, entitled, "A Gas Engine Driven Pumping Plant." The other paper was by Mr. L. E. Cooley, "A Proposed Dam and Water Power on the Mississippi River, at Keokuk, Ia."

Roadmasters and Maintenance of Way Association.

The Executive Committee of the Roadmasters and Maintenance of Way Association will meet at the Sherman House, Chicago, Dec. 13 and 14, to discuss matters relating to the welfare of the Association, and especially to lay out the work for the next annual meeting which is to be held in Milwaukee, in September or October, 1902.

The Car Foremen's Association of Chicago.

The regular meeting of the Car Foremen's Association will be held in Room 209, Masonic Temple, Chicago, Wednesday evening, December 11, at 8 o'clock. The following programme has been arranged: Discussion of the report of the committee presenting designs for a suitable card case for holding M. C. B. repair and defect cards; discussion of code of rules governing the condition of and repairs to passenger equipment cars in interchange; report of the committee on the condition of draft rigging on cars and suggestions for improvement.

The Engineers' Club of Philadelphia.

A business meeting of the Club will be held on Saturday, Dec. 7, at 8 o'clock, p.m. Nominations for officers for 1902 will be made. The retiring officers are: President, Henry Leffmann; Vice-President, L. Y. Schermerhorn; Secretary, L. F. Rodinella; Treasurer, George T. Gwilliam; Directors, James Christie, Charles Piez, Charles Hewitt.

The paper will be on the "Development of the Delaware River Water Front of Philadelphia, Including a Description of Bulkhead, Street, and Pier Construction," illustrated, by George S. Webster.

Railway Club of Pittsburgh.

In about a week the Railway Club of Pittsburgh will issue the first number of its official proceedings. It will include the constitution and by-laws, minutes of the organizing meeting, the first regular monthly meeting, and a list of the charter members of the new club, which are said to number 200. The next regular monthly meeting will be held at the Hotel Lincoln, Dec. 21, and a paper will be read by D. J. Redding, Master Mechanic of the Pittsburgh & Lake Erie road, on "The Condition of Pittsburgh Water and Its Effect on Boilers," after which a general discussion will be held. Regular monthly meetings are to be held on the fourth Friday of each month. J. D. Conway, of the Motive Power Department of the Pittsburgh & Lake Erie, is Secretary.

Southern & Southwestern Railway Club.

The Southern & Southwestern Railway Club, at its annual meeting elected officers as follows:

President, J. H. Watters, Master Mechanic, Georgia Railroad; First Vice-President, Julian R. Lane, General Manager, Macon & Birmingham; Second Vice-President, C. L. Rhodes, Master Mechanic, Georgia Southern & Florida; Secretary, W. A. Love; Treasurer, E. C. Spalding.

Three papers were read. Thomas E. Elliott, Chief Electrician for the Atlanta Railway & Power Company, read a paper on "Electricity as a Motive Power." "The Application of Experimental Engineering to the Advancement of the Industrial South" was the subject of a paper by Prof. Floyd C. Furlow, of the Georgia School of Technology. The other paper was by General Purchasing Agent R. P. C. Sanderson, of the Seaboard Air Line, who had for his subject "Oil as Fuel for Locomotives."

American Society of Civil Engineers.

At the meeting held on Wednesday, Dec. 4, at 8:30 p.m., R. G. Allanson-Winn, M. Inst. C. E., Ireland, addressed the Society on "The Protection and Improvement of Foreshores by the Utilization of Tidal and Wave Action," illustrating his remarks with lantern slides, showing the work actually accomplished by the use of long low groynes at Dymechurch, Deal, Southwold, Cromer, Mundesley and other places on the east coast of England; at Borth, in Wales; and at Middlekirk and Mariakirk, in Belgium.

The forty-ninth annual meeting will be held at the House of the Society, No. 220 West Fifty-seventh street, New York, on Wednesday and Thursday, Jan. 15 and 16, 1902. The business meeting will be called to order at 10 o'clock on Wednesday morning. The annual reports will be read, officers for the ensuing year elected, members of the Nominating Committee appointed, a report from the Committee on Amendment to the Constitution will be presented and the proposed amendment considered, and other business transacted. The arrangements for excursions and entertainments will be announced later.

The next annual convention will be held in Washington, D. C., May 20 and the rest of that week.

Engineers' Club of St. Louis.

The 533rd meeting was held Nov. 20, Vice-President Kinealy presiding; attendance, 30 members and 11 visitors. A committee of five on nominations for officers for the ensuing year was elected as follows: Messrs. W. A. Layman, Wm. H. Bryan, B. H. Colby, Julius Pitzman and William Bouton.

Mr. Layman stated that the members of the Board of Managers of the Association of Engineering Societies were requested to vote on the three following propositions, which he explained in detail:

"That the Secretary be instructed to prepare an index of the material contained in the *Journal* of the Association, ending with December, 1900, and to have said index printed, bound in paper and distributed to the members of the societies, and to subscribers, exchanges and advertisers, and that the Secretary be authorized to make such arrangements as he can for the procuring of advertisements in such index, in order to cover all or a part of the cost.

"That the Secretary be authorized to furnish, to the author of any paper, at 15 cents each, additional copies of the issue of the *Journal* containing such paper, provided due notice be given in advance, stating the number of such extra copies required.

"That from and after Jan. 1, 1902, the Secretary shall receive, in each year, as salary, 75 cents for each member of the societies forming the Association at the close of the preceding year."

Mr. Layman stated that although no action by the club as a body was necessary, as the members of the board had full power to act, he wished to bring the matter before the club for discussion.

The subject of the evening was a paper by Mr. Richard H. Phillips on "Quicksands." Mr. Phillips stated the character and methods of treating quicksands which he had encountered in his experience and gave the results of a number of microscopic tests, and tests for fineness. An interesting discussion followed the paper and was taken part in by Messrs. Barwick, Van Ornum, Colby, Johnson, Ferguson, Pitzman and Wall.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. H. B. Ayer, of Schenectady, N. Y., has been appointed Superintendent of the Manchester Works of the American Locomotive Co., at Manchester, N. H., succeeding the late Mr. James B. Henney.

—Mr. A. W. Robinson, M. Am. Soc. C. E., formerly of the Bucyrus Co., of South Milwaukee, has been appointed Consulting Engineer to the Canadian Government for river and harbor improvements and dredging plant.

—Mr. W. C. McMillan has been appointed General Manager of the Detroit & Cleveland Navigation Company to succeed the late Mr. Carter. Mr. McMillan has been connected with this company for a number of years and is a son of the United States Senator from Michigan, Mr. James McMillan.

—Mr. Charles Spencer Boyd, of New York City, has been appointed by Gov. Odell to succeed Col. John N. Partridge as State Superintendent of Public Works, New York State. Mr. Partridge resigned to become Police Commissioner of New York City. Mr. Boyd is about 44 years old and is a graduate of the School of Mines of Columbia University. He is connected with the banking firm of Joseph Walker's Sons, New York City.

—Mr. Howard L. Ingersoll, appointed Acting Division Engineer of the New York Central Lines south of Albany, has been about five years in railroad service. He was Assistant Engineer at the Lorain Steel Works from 1894 to 1895; Transitman and Assistant Engineer on the Lake Shore & Michigan Southern in 1896; and since then Assistant Engineer, Resident Engineer and Acting Division Engineer on the New York Central.

—Mr. Joseph W. Britton, a former iron maker of the Central West, died at his home in Cleveland, Ohio, Nov. 22, aged 72. For several years Mr. Britton was associated with his father in building railroads, and later established the Cleveland Boiler Plate Mill, and later was interested in the Cleveland Rolling Mill Co., of Newburgh, Ohio, and for 11 years served as Manager of its plate and sheet mills. He formed the Britton Iron & Steel Co., and was its President until 1891.

—Mr. B. C. Gesner, Master Mechanic of the Eastern Division of the Intercolonial Railway, began as a messenger in the mechanical department of this company Jan. 23, 1877, was promoted to fireman the following year and in 1882 became an engineman. He held this position until 1898, when he became General Air Brake Inspector. Mr. Gesner is 42 years old, having been born at Cornwallis, N. S., in 1859. As will be seen Mr. Gesner's whole railroad career has been with this company. He assumed his new duties on Nov. 1 last.

—Mr. G. R. Morrison, Division Superintendent of the Chicago, Milwaukee & St. Paul, was born in California in 1857. When 13 years of age he was a messenger for the Chicago & West Michigan, now known as the Pere Marquette, and for the two years following was an operator. In 1879 he was appointed Assistant Train Despatcher of the Wisconsin Valley, which position he held until 1881, when he became Chief Train Despatcher of the Chicago, Milwaukee & St. Paul. In 1892 Mr. Morrison was promoted to the position of Trainmaster.

—Mr. Charles A. Sindall, at one time Secretary of the Southern Railway & Steamship Association, died at his home in Atlanta, Ga., Nov. 25. Mr. Sindall was born Feb. 27, 1845, at Baltimore, Md., and began his railroad career in 1872 as general agent for the Central Railroad of Georgia. This position he held for three years. From 1875, until 1892, he was continuously Secretary of the Southern Railway & Steamship Association, after which he became connected with the Southeastern Freight Association, with which organization he was at the time of his death.

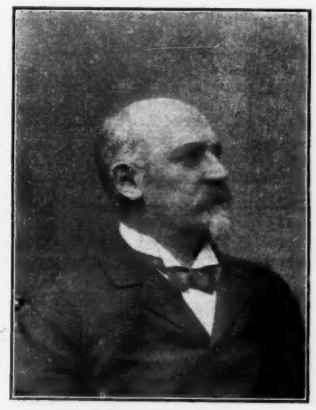
—Brigadier-General A. R. Buffington, Chief of Ordnance U. S. Army, was retired for age on Nov. 22. Gen. Buffington was born in Virginia and graduated from the Military Academy at West Point in 1861, and was brevetted Major for services during the Civil War. He was promoted to Colonel in February, 1889, and appointed Chief of Ordnance with the rank of Brigadier General in April, 1899. His administration has been marked by important developments in ordnance, by the building up of the coast defense system of the country, and by the study and purchase of various new types of rapid-fire field guns, which, with others designed in his department, are now being tested.

—Mr. Sam Fay has been appointed General Manager of the Great Central Railway, of England, succeeding Sir William Pollitt, who has been obliged to retire because of failing health. Sir William Pollitt is 59 years old and came up through the clerical department of the Manchester, Sheffield & Lincolnshire, now the Great Central, having been chief accountant of that railroad when he was 27. He was knighted in 1899. Mr. Fay is 44 years old and began his railroad work in 1872 as a clerk in the traffic department of the London & South Western. At the time of his appointment on the Great Central he was Superintendent of the Line of the South Western. He visited the United States a few weeks ago and met many railroad men here.

—Capt. William Crozier, Ordnance Department U. S. Army, recently on duty in New York, has been appointed by the President as Chief of Ordnance with the rank of Brigadier General, to succeed Gen. A. R. Buffington, who retired for age, Nov. 22. In the present organization of the army this is a detail for four years. At the end of the term the same officer may or may not be detailed again. Gen. Crozier assumed his new duties on Nov. 25. He is only 46 years of age, and junior to 28 other officers in the corps, but is regarded as one of the ablest officers in the Ordnance Department. His present appointment was predicted in this column some time ago. He graduated from the Military Academy in 1876 and served first in the artillery, being transferred to the Ordnance Department in 1881 and promoted to Captain in 1890.

—Major R. M. Sully, Superintendent of the Richmond Division of the Atlantic Coast Line, and who has held the office (formerly Superintendent of the Richmond & Petersburg) for 24 years, has been relieved of the duties of that office and has been appointed Special Agent of the company, with office at Petersburg. Major Sully is well known throughout the country, having been for many years Treasurer of the American Society of Railroad Superintendents. The new office to which he has been appointed has been established for the purpose of securing to the company the benefit of his extensive acquaintance with the property and his long experience. Major Sully is now about 65 years old and has been connected with Virginia railroads since boyhood. He began with the Virginia Midland in 1854, and has worked in the engineer corps, in the general offices and as agent. For a short time before becoming Superintendent he was General Freight Agent of the Petersburg road and the Richmond & Petersburg.

—Mr. Arthur W. Soper died on Sunday morning, Dec. 1, at his home in New York City, and a great number of people all over the United States will feel that they have lost a personal friend. Col. Soper (as he was universally known, although we believe that he never held military rank) was born at Rome, N. Y., in 1838. His first railroad service was on the Rome, Watertown & Ogdensburg, where he began as a clerk and passed through various grades until he became Assistant Superintendent.



In 1871 he went to St. Louis as Assistant Superintendent of the St. Louis & Iron Mountain (later St. Louis, Iron Mountain & Southern). Here he quickly established a reputation as an energetic and able railroad officer and citizen. He came to be General Manager of that railroad, which he worked with great efficiency under difficult conditions. In 1880 he went to New York City to take charge of the business of working in this country the patents for lighting cars by the Pintsch System of compressed oil gas. In this business he was very successful and he was President of the Safety Car Heating & Lighting Company, and also of the Pintsch Compressing Company. He had close relations with various other enterprises connected with railroads, and was a director of the Standard Coupler Company, the Citizens Insurance Company, and the American Mutoscope & Biograph Company; he had large interests in the Westinghouse Air Brake Company and in the Compressed Air Company. He was a member of the Chamber of Commerce and of numerous clubs and social organizations. It is practically certain that a man so active and enterprising as Colonel Soper must have had some enemies, but we have never yet discovered one of them. It is absolutely certain that he had more friends than are given to most men and he deserved them. He was large-minded, impetuous, and enthusiastic, and had a tender and sympathetic heart. We have known several instances of his generosity when generosity could have given him no other possible return than the pleasure of making life easier and happier for other people. His energy and activity were only equalled by his persistence. He knew no obstacles and would tolerate none. The net result of these qualities was a singularly interesting character and a singularly fortunate life. Few men whom we can think of now will be regretted so genuinely and so widely.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—M. Riddle, Jr., heretofore Roadmaster, has been appointed Superintendent of the Richmond Division in the place of R. M. Sully, who has been appointed Special Agent. Mr. Riddle's office is at Petersburg, Va. The office of General Superintendent of lines north of Weldon, which was held by E. T. D. Myers (President of the Richmond, Fredericksburg & Potomac) appears to have been abolished.

Baltimore & Ohio.—The jurisdiction of W. R. Woodford, General Superintendent, has been extended over the Middle and Akron Divisions. J. C. Stuart, heretofore General Superintendent of the Middle & Northwestern Divisions, has been appointed General Superintendent of Transportation, succeeding William Gibson, retired. The line from the west end of Chicago Junction Yard to Chicago will be known as the Chicago Division, and D. D. Carothers has been appointed Superintendent of this Division, with headquarters at Chicago, and will report direct to the General Manager. The Division Engineer will report to the Superintendent. F. C. Batchelder, heretofore Superintendent of the Chicago Division, has been appointed Superintendent of the Middle Division, with headquarters at Newark, Ohio, succeeding T. J. English transferred (page 815). The Superintendent of Telegraph and Superintendent of Dining Cars will report to the General Superintendent of Transportation. All effective Dec. 1.

Burlington, Cedar Rapids & Northern.—C. S. Weston, heretofore Trainmaster, has been appointed Assistant Superintendent, with headquarters at Cedar Rapids, Iowa.

Canadian Pacific.—Arthur Piers, heretofore Superintendent of Steamship Lines, has been appointed General Superintendent of Steamships, with headquarters at Montreal.

F. F. Busteed, heretofore Resident Engineer of the Western Division, has been appointed Superintendent Maintenance of Way of the Pacific Division, with headquarters at Vancouver, B. C. The following Resident Engineers have been appointed: R. S. Emsley, with headquarters at Fort William, Ont.; J. E. Switzer, at Winnipeg, Manitoba; R. A. Davis, at Moosomin, Assiniboia; A. J. McLean, at Medicine Hat, Assiniboia; and G. R. Richardson, at Cranbrook, B. C.

Copper Range.—C. S. Fales, Trainmaster, has been appointed Superintendent also.

Davenport, Rock Island & Northwestern.—O. B. Grant has been appointed General Manager, succeeding E. F. Potter resigned.

Evansville & Terre Haute.—E. H. Pfafflin, in addition to his duties as Chief Engineer, has been appointed Acting Superintendent, succeeding A. C. Hone, Superintendent, resigned.

Galveston, Harrisburg & San Antonio.—See Southern Pacific.

Great Central Railway of England.—Sam Fay has been appointed General Manager, succeeding Sir William Pollitt, resigned on account of ill health.

Great Northern.—J. N. Hill, heretofore Third Vice-President, has been appointed Vice-President, succeeding W. P. Clough, resigned. Mr. Clough will live in New York City in connection with the affairs of the Northern Securities Company.

F. Weyerhauser has been elected a Director, succeeding W. P. Clough.

Houston & Texas Central.—See Southern Pacific.

Kansas City, Watkins & Gulf.—C. F. Crockett has been appointed General Freight and Passenger Agent.

New York Central & Hudson River.—Howard L. Ingersoll, heretofore Resident Engineer, has been appointed Acting Division Engineer, of the Eastern Division, with headquarters at New York, succeeding J. C. Nelson, resigned. William F. Jordan, formerly Assistant Engineer in the general designing department, has been appointed Resident Engineer on new construction, with headquarters at New York, succeeding Mr. Ingersoll.

Northern Securities Company.—W. B. Dean has been elected a Director, succeeding J. H. Schiff. (See Great Northern.)

Pennsylvania Company.—C. S. Sims is Superintendent of the Chicago Terminal Division.

Plant System.—S. H. Dare has been appointed General Western Freight Agent, at Cincinnati, Ohio.

St. Louis Southwestern.—A. B. Liggett has been appointed Superintendent of Transportation of this company and the St. Louis Southwestern Ry. of Texas, with headquarters at Tyler, Texas, succeeding J. W. Donovan, assigned to other duties, effective Dec. 1.

Seaboard Air Line.—F. K. Huger has been appointed Superintendent of the Second Division, with headquarters at Raleigh, N. C., succeeding J. M. Turner, resigned. E. J. Cunningham, heretofore Trainmaster, has been appointed Car Service Agent, succeeding H. A. Gausewitz, resigned.

The headquarters of C. H. Hix, First Division Superintendent, have been removed from Raleigh, N. C., to Richmond, Va.

Southern Pacific.—M. L. Robbins has been appointed General Passenger Agent of this company (Atlantic System) and the Galveston, Harrisburg & San Antonio, and Thomas J. Anderson becomes Assistant General Passenger Agent, of these lines, and the Houston & Texas Central, with headquarters at Houston, Texas, effective Dec. 15.

Texas & Louisiana.—F. W. Scott has been appointed Auditor, with headquarters at Lufkin, Texas, succeeding F. C. Fogarty.

Virginia & Southwestern.—C. A. Shields, Superintendent, has resigned.

Wrightsville & Tennille.—L. Archer has been appointed Master Mechanic, with headquarters at Tennille, Ga., succeeding R. A. Moore, resigned.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

AVA NORTHERN.—An officer writes that this projected line in Missouri between Cedar Gap and Ava, 14 miles, is to be operated by steam. Surveys are completed for six miles and the remaining surveying work will be finished in about three weeks. The maximum grade is to be 2½ per cent., with very little heavy work, no bridges and few trestles. It is hoped that grading can be begun by March 1. (Nov. 22, p. 815.)

BISMARCK, WASHBURN & GREAT FALLS.—It is announced that an extension 25 miles long is to be made to Coal Harbor, which is on the east side of the Missouri River. The line is now in operation between Bismarck, N. Dak., and Washburn, 45 miles, and it is projected to Great Falls, a distance of 180 miles.

BOSTON & WORCESTER STREET.—At the first meeting of this new company, held recently, officers were elected and contracts for the proposed electric line between Boston and Worcester, Mass., were let to J. F. Shaw & Co., amounting in total to more than $1,500,000. Work is to begin at once. The distance between Boston and Worcester on the line of the Boston & Albany, which is paralleled by the new company, is 44 miles.

CANADIAN NORTHERN.—It is reported that the directors of this company intend to make it into a trans-continental line by building an extension from Port Arthur eastward to a connection with the Canada Atlantic, the Atlantic port of which is Quebec. The company will, in about 40 days, have its new line between Winnipeg and Port Arthur completed, and the new route proposes to make its Pacific port Fort Simpson, which is 400 miles north of Vancouver.

A surveying party has gone to Prince Albert, N. W. T., to commence work on the location of the proposed extension of the company's line to Edmondton, N. W. T. The Canadian Northern is planning a very large project in this locality and is now at work locating a line from its present terminus at Erwood, District of Saskatchewan,

to Prince Albert, which is 178 miles in an air line. From Prince Albert to Edmondton is 450 miles further, and it is proposed to begin actual work on the line next spring. (Oct. 11, p. 711.)

CANADIAN PACIFIC.—Surveys are reported between Lauder and Glenboro, Man., a distance of 67 miles northeast. The surveyors are at present working near the town of Margaret.

Surveys are reported completed on the company's projected line between Carman, Man., and Killarney as far as Somerset, which is 34 miles southwest of Carman. (Construction Supplement, Oct. 11, 1901.)

CAPE BRETON EXTENSION.—Contract has been let to James G. McDonald for the section of this new line in Nova Scotia between Hawkesbury and St. Peters, two miles. (Construction Supplement, Oct. 11, 1901.)

CENTRAL NEW ENGLAND.—The Connecticut Railroad Commissioners have approved the lay-out of the loop petitioned for by the East Granby & Suffield, to shorten the circuit around the Montague farm. This action saves the company at least $30,000 by obviating the need for high trestles in East Granby. (See issues of Nov. 1, p. 764; Oct. 18, p. 729; Oct. 11, 1901; Aug. 23, p. 596.)

CHICAGO GREAT WESTERN.—Merchants and farmers who would be benefited have petitioned this company to build an extension from New Hampton, Iowa, north and east to LaCrosse, Wis. It is stated that they will give a bonus of $50,000 to the company if the line is built.

Winston Bros., of Minneapolis, have been awarded the contract for grading the Fort Dodge-Omaha extension of the Great Western from Carroll to Council Bluffs, Iowa, a distance of about 90 miles. The work of grading is to commence early in the spring. The contract for the grading of the line between Fort Dodge and Carroll has not been let yet.

DES MOINES INTERURBAN (ELECTRIC).—The contract for grading the line of this company from Des Moines to Colfax, Iowa, a distance of 20 miles, has been awarded to R. A. Elzy, of Marshalltown, Iowa. The contract calls for the completion of the line by June 1, 1902. The contractor began the work of grading this week and will push it as long as the weather permits. (July 3, p. 491.)

EAST KOOTENAY.—Arrangements with the Government of British Columbia are being made by Mackenzie & Mann for building this line from Hope to Midway, B. C., where the Canadian Pacific and Great Northern lines terminate. The Government wants a more direct route than the one proposed originally by the Canadian Pacific, and one has been surveyed through the mountains from Hope to Princeton. From there to Midway the conditions are easy and it is this route that has been chosen. The total distance is about 155 miles direct.

FAIRCHILD & NORTH EASTERN.—Commencing Dec. 1, trains were run over the entire length of this lumber line in Wisconsin between Fairchild and Bright, 33 miles. Until recently it has only been operated as far as Greenwood, 23 miles.

GEORGIA R. R.—An officer writes in regard to the reported extension from Covington, Ga., to Logansville, 20 miles, that no such work is at present contemplated. (Nov. 22, p. 816.)

HALIBURTON, WHITNEY & MATTAWA.—Notice of an application to the Canadian Legislature for permission to change the location of this projected line between Haliburton, Ont., the terminus of the Grand Trunk, and Mattawa, has been given by Messrs. Gordon & Sampson, of Toronto. The distance from Haliburton to Whitney is about 37 miles, and from Whitney to Mattawa is 55 miles more, in a northerly direction. There are no north and south roads at present in existence in this part of the country.

INDIANA HARBOR (ELECTRIC).—This company was incorporated in Indiana, Nov. 23, with a capital stock of $250,000, to build an electric line from the town of Indiana Harbor, east of Chicago on Lake Michigan, to a junction with the Joliet & Northern Indiana, 12 miles. The directors are: C. W. Hotchkiss, A. D. Erskine, J. S. Field, C. R. Francis, Jarvis Hunt and Lee J. Dudley, of Chicago, and James Miles, of Riverside, Ill.

IOWA & ST. LOUIS.—The stockholders of this company will meet in Kansas City, Dec. 30, to consider increasing the capital stock $700,000 and amending the charter to permit building a line north from the present terminus through Schuyler and Putnam counties, Mo., and Appanoose county, Iowa, to Centreville, a distance of about 40 miles. A proposition to issue bonds at the rate of $15,000 per mile will also be considered. The Iowa & St. Louis was incorporated last April and has at present about five miles of road built in Adair County, Mo. (Construction Supplement, Oct. 11, 1901.)

JOHNSTOWN PASSENGER (ELECTRIC).—This line, which is at present in operation between Johnstown and Windber, Pa., 10 miles, is to be extended from Somerset County to the town of Somerset, and the capital stock has been increased from $800,000 to $2,000,000 for this purpose. New bonds have been issued for a similar amount.

LAKE BENNETT.—Application is being made to the Dominion Government for incorporation to build a railroad from the mouth of the Dyea River near the provincial boundary, to Lake Bennett, and thence to Selkirk on the Yukon River. A similar application was made in August, 1900. (Construction Supplement, Oct. 11, 1901.)

LOUISVILLE & NASHVILLE.—Surveys are reported on this company's line between Birmingham and Calera, Ala., preparatory to double-tracking between these points, a distance of 33 miles. Work also is reported in progress straightening the curves between these two points, involving at one place a cut eight miles long at an estimated cost of $30,000 a mile.

MANITOBA & KEEWATIN.—Messrs. Howell, Mathers & Howell, solicitors of Winnipeg, Man., give notice of an application for an act to build a railroad from the city of Winnipeg northeasterly through Manitoba to its eastern boundary, and thence easterly through the District of Keewatin to tidewater at the mouth of the River Severn, or southeasterly therefrom, with power to build branches to Lake Winnipeg and to the main line of the Canadian Pacific.

MARYLAND, SPARROWS POINT & NORTH POINT ELECTRIC.—An officer writes that the surveys for this proposed line 14 miles in length, between Baltimore, Sparrows Point and North Point, are practically completed and that contracts for grading, track laying, etc., will be ready to be let within 30 days. The bids for rails and rolling stock required will be asked for within 60 days. The maximum grades of the line are 2 per cent., and it has been constructed as a first-class suburban line in all particulars. Robert S. Carswell, of Baltimore, is President. (Nov. 22, p. 816.)

MASSACHUSETTS ROADS.—A petition has been filed by Roscoe C. Taft, of Boston, and others, for incorporation of a company to build a railroad from Springfield to New York State through Hampden and Berkshire Counties.

MEXICAN CENTRAL.—President Robinson is quoted as saying that a very large amount of improvement work, amounting practically to rebuilding the line, is to be done on the newly-acquired Monterey & Mexican Gulf, and that this property will be brought up to the standard of the Mexican Central. This involves also the replacing of 20 or more wooden bridges with steel structures. No detailed plans have as yet been announced. (Construction Supplement, Oct. 11, 1901.)

MEXICAN NATIONAL.—Work has been begun on widening the roadbed of the Texas-Mexican line which runs between Corpus Christi and Laredo, Texas, 161 miles. This is preparatory to making the road standard gage, and the main line between Laredo and the City of Mexico, including its branches, is also to be standard gage as soon as the work can be done. There are a few branches of this system which run to mining camps in the mountains which will remain narrow gage. (Construction Supplement, Oct. 11, 1901.)

MISSOURI, KANSAS & TEXAS.—An officer writes in regard to the reported extension of the company's line from Coffeyville, Mo., southwest, that investigations have been made in that direction but no decision has as yet been arrived at.

MOBILE, JACKSON & KANSAS CITY.—In connection with the purchase by the company of the Kingston & Central Mississippi, it is announced that an extension is to be built from a point near Augusta, Miss., to a junction with the Kingston & Central Mississippi at Laurel, 32 miles north, with the eventual intention of continuing the line to Memphis, Tenn. Contracts are to be let within the next 30 days.

MUSCOGEE & WESTERN.—Work was reported begun, Nov. 20, on this new line, at Tahlequah, Ind. T., and it is proposed in time to extend it from Fayetteville, Ark., to Shawnee, Okla. T.

OAKLAND & SAN JOSE (ELECTRIC).—Articles of incorporation were filed, Nov. 18, by a company to build an electric line between the points named in California, with three branch lines aggregating 33 miles in length which will give a total of 83 miles. The company is capitalized at $2,500,000, with $100,000 paid up. The Southern Pacific is paralleled by the projected route between Oakland and San Jose.

PENNSYLVANIA.—Proposals for labor, material, etc., for the elevation of the tracks in Chester, Pa., were received by Wm. H. Brown, Chief Engineer, at his office in Philadelphia on Nov. 30. The work includes masonry for about 1,600 ft. of broken range retaining wall and the necessary abutments and column foundations for five undergrade bridges.

PERE MARQUETTE.—Surveys are reported for a new line between Hersey and Wingleton, Mich., on the Ludington Division in order to avoid some of the heavy curves on the present line. It is intended to use the new line, if built, for freight.

PHILADELPHIA & READING.—A charter has been secured for what is known as the Norristown & Main Line Connecting R. R., to build the approaches and bridge between the main line of the Philadelphia & Reading above Bridgeport, Pa., and the Norristown side of the Schuylkill River.

PORT AMERICA (PORTO RICO).—Concession for two lines in Porto Rico was signed by President Roosevelt Nov. 26. One of these is to run north and south between San Juan on the north and Port America, near the old Spanish port of Guayama; and the other is to run east and west from Aguadilla to Eucanaba Honda, a total of over 100 miles. A concession was previously granted for these lines which was declared illegal by the Attorney General because exempt from taxation, but it has since been modified so as to make the exemption from taxation dependent on the approval of the Porto Rican Legislature. General Roy Stone, of Washington, D. C., is interested.

ST. LOUIS SOUTHWESTERN.—A bridge half a mile long over the Mississippi River at Thebes is to be built by the St. Louis Southwestern and the Eastern Illinois. At present the river is crossed by means of a car ferry which delays the service. During the past year the grade has been reduced on 136 miles of the company's main line and grade reduction on 125 more is contemplated during the coming year. For further mention of the Mississippi bridge see Bridge Department in past issues.

TEMISCAMINGUE.—Forty miles of this new line north from North Bay, Ont., is surveyed out of the total 105 projected. The Public Works Department of Ontario announce that they will call for tenders for building as soon as the surveys are completed. (Nov. 15, p. 798.)

TENNESSEE ROADS.—In reference to the projected railroad which was to be built by the State of Tennessee to open up coal lands owned by it, the Secretary of State writes that no steps have as yet been taken in regard to building. John S. Denton, of Nashville, Tenn., is Chairman of the Board of Prison Commissioners who were authorized by the last General Assembly to have the road built.

TORONTO, LINDSAY & PEMBROKE.—The Public Works Department of Ontario has given approval of an eight-mile extension from Bancroft, Ont., on the line of the Irondale, Bancroft & Ottawa through the districts of Herschel, Monteagle and Faraday in Hastings County. (Construction Supplement, Oct. 11, 1901.)

TRAVERSE CITY, LEELANAU & MANISTIQUE.—Articles of incorporation have been filed by this company in Michigan, with a capital stock of $500,000, for the purpose of building a railroad from Traverse City to Northport, by way of Bingham, Sutton's Bay and Omena, about 30 miles. The road is to connect with the Grand Rapids & Indiana at Traverse City and intends to operate a car ferry line to connect with the "Soo" line at Manistique. The directors of the company are: R. R. Methany, Charles E. Murray, Benj. B. Methany, Daniel W. Kaufman and Nathan M. Kaufman.

YUKON RAILWAY.—A new line 12 miles long is to be built in the Klondike in the early part of next year by McLean Bros., of Vancouver. The estimated cost is $600,000.

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—A reorganization of this property is to take place, involving the creating of three chief divisions and the issue of $20,000,000 capital stock. The new system, which is to occupy the same relation to the Baltimore & Ohio as does the Baltimore & Ohio Southwestern, all the stock of which is owned by the B. & O., is to be known as the Baltimore & Ohio, Pittsburgh, Lake Erie & West Virginia system, and will include the Pittsburgh & Western; Pittsburgh, Cleveland & Toledo; Pittsburgh, Painesville & Fairport; Cleveland Terminal & Valley; Cleveland, Lorain & Wheeling; Ohio River System; West Virginia Short Line; Central Ohio Lines, and B. & O. holdings in the Pittsburgh Junction; West Virginia Central & Pittsburgh, and Monongahela River Lines. This reorganization, when completed, will give a main line extending from Philadelphia to Pittsburgh and Wheeling, including the Chicago Division, the Southwestern System, from West Virginia to St. Louis, and the Pittsburgh, Lake Erie & West Virginia System.

Common and preferred shareholders of record Dec. 10 will be permitted to subscribe at par for new common stock to the amount of 20 per cent. of their holdings. The outstanding stock consists of $48,527,000, common, and $59,227,000 preferred. Holders of the $11,473,000 convertible bonds also have the option, upon an exchange of their bonds for stock, to subscribe for the new shares as above. In case all the convertible bonds should be converted by their holders, in addition to the shareholders who subscribe for the new stock, the total resulting issue of common stock would be $84,000,000.

CENTRAL OF GEORGIA.—The gross earnings of the company for the four months ending Oct. 31, 1901, were $2,554,601, an increase of $152,823 over the same period last year. The expenses and taxes, however, in that period increased $190,447, leaving net earnings $805,483, a decrease of $37,623. The statement for this year is on a mileage of 1,844; that for last year is on a mileage of 1,644. The percentage of expenses to earnings this year is 68.46; last year it was 64.89.

CHICAGO & NORTH WESTERN.—Kuhn, Loeb & Co. offer for sale the balance of the issue of $4,000,000 3½ per cent. gold bonds, payable Aug. 1, 1936, and secured by first mortgage on the Sioux City & Pacific. The latter company has been absorbed by the Chicago & North Western and its bonds assumed, with principal and interest unconditionally guaranteed. The total price paid by the Chicago & North Western for the Sioux City & Pacific, including payment of the old first mortgage 6s, was $3,500,000 and title was taken last August, but previous to that the Sioux City & Pacific made a new mortgage to secure the issue of $4,000,000 bonds referred to, to provide for reimbursement of the Chicago & North Western, for payment of other debt, purchase of new equipment and new construction. One hundred and twenty-five miles of line was covered by the mortgage. The price of the bonds as now offered is 104½ and interest.

DETROIT SOUTHERN.—First mortgage 4 per cent. 40-year gold bonds to the extent of $4,000,000 on the Ohio Southern Division have been listed by the New York Stock Exchange; also $2,750,000 first mortgage 50-year 4s; $6,000,000 of preferred, and $7,000,000 common stock voting trust certificates.

DETROIT, YPSILANTI, ANN ARBOR & JACKSON ELECTRIC.—This property was reported taken over by the Everett-Moore Syndicate, Nov. 19. The $2,600,000 stock outstanding is said to have been purchased at 60 cents on the dollar.

ERIE.—Gross earnings for the four months ending Oct. 31, 1901, were $14,672,152, as against $12,976,517 for the same period last year. After deducting working expenses of $9,793,420 (an increase of $536,918 over the same period last year) the net earnings were $4,878,731, while for the same four months last year they were $3,720,015, an increase of $1,158,716.

HUDSON VALLEY (ELECTRIC).—This company has recently filed a mortgage to secure $4,000,000 of 5 per cent. gold bonds, due in 1951, but subject to retirement at 110 and interest at the option of the company. The capital stock of the company has also been increased from $2,600,000 to $3,000,000. Large amounts are being spent on extensions and betterments and at present there are 83 miles of line in operation. The headquarters of the company is at Glens Falls, N. Y.

INDIANAPOLIS & EASTERN TRACTION.—This company has taken over the Indianapolis & Greenfield Rapid Transit Co., which has $400,000 stock and $300,000 bonds and owns a line between Greenfield and Irvington, Ind., 17½ miles, making connection at Irvington with the Indianapolis Street Ry., and thus securing entrance into Indianapolis. The Indianapolis & Eastern Traction Co. was incorporated last spring with $200,000 capital, and notice was given, Oct. 25, of an increase to $800,000. F. M. Fauvre is President.

LAKE TAHOE RY. & TRANSPORTATION.—This company, operating a line 15 miles long between Truckee and Tahoe, Cal., has filed a mortgage with the Mercantile Trust Co., of San Francisco, for $500,000. The net earnings of the company last year, with the miscellaneous receipts, amounted to $4,575, and the surplus was $3,830, according to the Interstate Commerce Commission.

LEHIGH VALLEY.—The joint statement of the railroad and coal companies for the 11 months ending Oct. 31, 1901, shows net earnings of $4,974,067, as against $1,953,919 last year. During the month of October alone the two companies showed net earnings this year of $832,997, while in October, 1900, they reported a net loss of $356,159.

NORTHWESTERN ELEVATED, CHICAGO.—Shareholders are offered the privilege of subscribing at 96 for $4,000,000 additional first refunding 4 per cent. bonds at the rate of one bond for each 25 shares of stock held. This new issue is to be applied to payment of the old 5 per cent. first mortgage bonds, which are to be redeemed Jan. 1, 1902.

PHILADELPHIA & READING.—Arrangements have been made with Drexel & Co. for refunding the North Pennsylvania $4,500,000 7 per cent. bonds due Jan. 1, 1903, into a 3.3 per cent. bond to run for 50 years. Holders will be given opportunity to exchange until Jan. 1, 1902. The Philadelphia & Reading will buy the holdings of those who do not care to make the exchange. This refunding will save the Reading Co. $166,500 interest per annum.

UNION PACIFIC.—Gross receipts for the four months ending Oct. 31, 1901, were $17,110,361, an increase of $1,028,882 over the same period last year, on 58 more miles. After deducting expenses, including taxes, there remained for the four months given a surplus of $8,355,683 as against $7,292,591 for the same period last year. Thus the expenses, including the increased mileage, were $31,208 less than they were for the same period in 1900.

WISCONSIN CENTRAL.—Proposals were received, until Nov. 30, to sell to the sinking fund first series mortgage bonds issued under the consolidated mortgage dated Jan. 1, 1879, to the amount of $450,000. Bonds were received for cancellation in the sinking fund under the terms of said mortgage; payment therefor to be made on or after Dec. 2. The trustees, however, reserved the right to invest at their discretion said bonds at public or private sale, if the price named was not satisfactory.